

Pival

CHEMICAL INFORMATION

TYPE: Rodenticide (indandione)

FORMULATION: Powder mixed with bait material (e.g., grain). Also as a ready-to-eat bait in granular, pellet, tablet and paraffinized block forms.

REGISTERED USES: Control of Norway rats, roof rats and house mice in and around buildings, and for California ground squirrels, thirteen-lined ground squirrels, meadow and pine mice/voles in orchards and groves, non-crop rights-of-way, and other non-crop areas such as lawns, ornamentals, golf courses, parks, and nurseries.

BACKGROUND:

Mode of action: Pival is an anticoagulant rodenticide in a class of chemicals called indandiones. Indandiones depress clotting capabilities of the blood and concurrently increase permeability of capillaries throughout the body, predisposing the animal to widespread internal hemorrhage. This generally occurs in the rodent after several days of bait ingestion. Unlike the anticoagulant coumarin compounds, indandiones may cause symptoms and signs of neurologic and cardiopulmonary injury in laboratory rats leading to death before hemorrhage occurs. These actions account for the greater toxicity of indandiones in rodents.

Aquatic toxicity: There have been only two aquatic bioassays performed with pival. This was with bluegills and rainbow trout and resulted in LC50s of 1.6 and 21.0 ppm, respectively. No bioassays have been conducted using freshwater invertebrates, marine/estuarine organisms, or aquatic field studies. The hazard to aquatic organisms needs to be considered, however, since pival is registered for use where the bait can be broadcast in open areas, even though in a worst case scenario of application in an orchard, concentrations should be far below any amount that might cause a problem. EPA has determined that this compound will have no effect on aquatic listed species.

Terrestrial toxicity: Toxicity varies widely among the indandiones and among species, with some birds and mammals being highly sensitive and others fairly resistant. Massive single exposure or repeated low dosages may cause poisoning (Buck et al. 1982). Total dosage to death will be much lower in anticoagulants with repeated exposures over an extended period than in acute exposures, and the majority of mortalities will occur during or after the second week of exposure (Mendenhall and Pank 1980, Bennett et al.). Single dose toxicity may be 5-100 times the multiple dose toxicity, depending on species (Jones 1977). The amount of data describing toxicity of indandiones to terrestrial taxa varies, with pival being the least tested compound and diphacinone perhaps the most tested, and most toxic, compound.

Most of the products containing pival may only be used in and around buildings for control of rats and mice, and it must also be applied in tamper-resistant bait boxes and in locations inaccessible to wildlife. However, it is also registered for broadcast applications in open areas, thus it could likely cause harm to any listed mammal which would consume the bait. While

adherence to label instructions would not normally allow access by wildlife to pival, consideration should be given to the possibility of direct oral toxicity, especially where human development has encroached on habitat of listed mice and rats. Larger mammals (e.g., deer) might feasibly ingest small quantities, but because of their large size, there would be no effect. The secondary toxicity is considered very low because the levels of pival in the target animals are too low to be toxic to a predator or scavenger under all but the most extreme circumstances.

Thus, it is concluded that there will be no effect on listed species from secondary exposure. Because birds are considerably less susceptible than mammals to anticoagulants, EPA has determined there is no effect on avian species and consequently no avian secondary effects. Potential exposure/impact of pival on plants/pollinators would be non-existent since it is an anticoagulant.

Wildlife incidents: None reported.

BIOLOGICAL OPINION

CHEMICAL REFERENCE TABLE

(The following table contains only those species for which the Service provided a jeopardy or no jeopardy call. Species not included in this list are either not affected by the chemical or have no chance for exposure. For a complete list of all species considered in this opinion, refer to the master species list on page III-1 of the species profile section.)

Species Name	J/NJ	PAGE
MAMMALS		
Alabama beach mouse	J	60
Amargosa vole	J	60
Anastasia Island beach mouse	J	61
Carolina northern flying squirrel	J	61
Choctawhatchee beach mouse	J	60
Florida panther	J	61
Florida salt marsh vole	J	62
Fresno kangaroo rat	J	63
Giant kangaroo rat	NJ	69
Hualapai Mexican vole	J	63
Jaguarundi	J	64
Key Largo cotton mouse	J	64
Key Largo woodrat	J	64
Louisiana black bear	J	65
Lower Keys rabbit	J	65
Morro Bay kangaroo rat	J	65
Ocelot	J	64
Perdido Key beach mouse	J	60
Point Arena mountain beaver	J	66
Salt marsh harvest mouse	J	66
San Joaquin kit fox	J	66
Silver rice rat	J	67
Southeastern beach mouse	J	61
Stephen's kangaroo rat	J	68
Tipton kangaroo rat	J	63

Species Name	J/NJ	PAGE
Utah prairie dog	NJ	69
BIRDS		
Audubon's crested caracara	J	68
REPTILES		
Eastern indigo snake	NJ	70

RATIONALE FOR JEOPARDY DETERMINATIONS

Alabama beach mouse, Choctawhatchee beach mouse, and Perdido Key beach mouse - Exposure of these beach mice to pival could occur through consumption of poisoned baits when used to control rodents within or in close proximity to their occupied habitats. Since all three subspecies occur in areas that are being encroached upon by various types of human development, there is a high possibility of pival being used where these mice could come in contact with it. All three of these beach mice are restricted to mature coastal barrier dune systems along the Gulf of Mexico. The Choctawhatchee beach mouse is presently known to occur only on Shell Island at St. Andrews Bay in Bay County, Florida, and on approximately 5 miles of beach dune habitat (coastline up to 500 feet inland) near Topsail Hill, from around Morrison Lake eastward to Stalworth Lake, Walton County, Florida. The Alabama beach mouse presently is surviving only on disjunct tracts of the sand dune system from Fort Morgan State Park to the Romar Beach area in Baldwin County, Alabama. The Perdido Key beach mouse occurs only on Perdido Key in Baldwin County, Alabama and Escambia County, Florida. The distance to which occupied habitat of these species extends inland from the beach varies depending upon the configuration of the sand dune system and the vegetation present. Both subspecies utilize portions of the frontal or primary dunes; interdunal areas; and dunes further inland (secondary or interior dunes). Because of the restricted distributions of these species and the likelihood of pival being used for rodent control within or adjacent to areas which they inhabit, it is the Service's biological opinion that the registered use of pival is likely to jeopardize the continued existence of the Choctawhatchee beach mouse, the Alabama beach mouse, and the Perdido Key beach mouse.

Reasonable and Prudent Alternative(s) - If implemented the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of pival within 100 yards of occupied habitat of the Choctawhatchee beach mouse, the Alabama beach mouse, and the Perdido Key beach mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Amargosa vole - The primary exposure of pival from registered uses can occur when the Amargosa vole eats bait from bait boxes used for muskrat control. Therefore, it is the biological opinion of the Service that the use of pival is likely to jeopardize the continued existence of the Amargosa vole.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Amargosa vole: prohibit the use of pival within 100 yards of the occupied habitat of the Amargosa vole.

Incidental Take - With implementation of the reasonable and prudent alternative described above, no incidental take is anticipated and therefore none is authorized.

Anastasia Island beach mouse and Southeastern beach mouse - These two beach mice are endemic to the east coast of Florida. The Anastasia Island beach mouse is presently believed to occur only on Anastasia Island, St. Johns County, Florida. The southeastern beach mouse is believed to presently occur only from Florida's Mosquito (Pounce) Inlet in Volusia County south to Hutchinson Island in St. Lucie County, Florida. Both subspecies inhabit sand dunes vegetated by sea oats and dune panic grass and the scrub adjoining these dunes, which is vegetated with oaks, sand pine, palmetto, sea grapes, and/or wax myrtle. Since the ranges of both species have been and continue to be encroached upon by various types of human development, it is likely that pival could be used for pest control in areas where both these beach mice occur. Exposure of the mice to pival would occur through ingestion of poison baits, which would result in direct mortality of individuals of the species. Accordingly, it is the Service's biological opinion that the registered use of pival is likely to jeopardize the continued existence of the Anastasia Island beach mouse and the southeastern beach mouse.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of pival within 100 yards of occupied habitat of the Anastasia Island beach mouse and the southeastern beach mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Carolina northern flying squirrel - This species may be directly exposed to pival poisoning from its registered use to control rats and mice around buildings. The Carolina northern flying squirrel occurs in coniferous and northern hardwood forests, and may occasionally forage on the ground. Where land use changes and development encroach on the species' habitat there is a potential risk of the squirrel coming in contact with pival bait that is placed outside of buildings (e.g., storage sheds and barns). Pival is toxic to rodents and would most likely kill a northern flying squirrel if it consumed the bait. Due to the restricted range and small population of the Carolina northern flying squirrel, any poisoning of individuals could threaten the survival of the species. Therefore, it is the Service's opinion that the use of pival is likely to jeopardize the continued existence of the Carolina northern flying squirrel.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Carolina northern flying squirrel: prohibit the outdoor use of the chemical within the species' occupied habitat.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Florida panther - The Florida panther may be exposed to pival by feeding on rodents or other animals that are dead or incapacitated from this rodenticide poison. Exposure may also occur by ingestion of meat and fish flavored baits. Panthers venture into agricultural and other areas

where this rodenticide is likely used and poisoned target animals would be found. This poison has been implicated in the deaths of raccoons, fox, rabbits, and mountain lion. EPA has not provided adequate data relating to felids to evaluate the secondary poisoning hazard of pival. Sensitivities to indandiones often vary by orders of magnitude among taxa. Some indandiones are known to present a secondary poisoning to felids. Given the similar mode of action of pival, such a hazard must be considered a possibility. Even if a panther ingested a sublethal dose of poison, rodenticide induced internal hemorrhaging could weaken a panther to the degree that the animal would be very susceptible to fatal disease or infections. Because of the critically small panther population, the loss of even one panther could threaten the survival of the species. Therefore, it is the Service's opinion that the use of pival is likely to jeopardize the continued existence of the Florida panther.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Florida panther: prohibit the use of the chemical within 20 miles of the boundary of any Federal and State lands (e.g. National Wildlife Refuge, National Park, National Preserve, State Park, State Preserve, State Wildlife Management Areas, etc.) and Indian Reservations that provide suitable panther habitat south of Charlotte, Glades and Martin counties, Florida.

Incidental Take - Because individuals of the species may disperse beyond a given home range, the use and toxicity of the pesticide is still a concern. Consequently the Service anticipates that an unquantifiable level of incidental take may occur as a result of the use of the pesticide outside of the prohibited use zone.

Reasonable and Prudent Measures(s) - The following reasonable and prudent measure for minimizing incidental take should be adopted and implemented: within an area extending 5 miles from the edge of the prohibited use zone, the user should remove and properly dispose of any dead or incapacitated animal likely to have been poisoned during the period of rodenticide use.

Florida salt marsh vole - Exposure of the vole to pival could occur through consumption of poisoned baits used to control rodents in close proximity to the vole's occupied marsh habitat. There is a possibility of the rodenticide being used around buildings, rights-of-way, and other open areas, adjacent to salt marsh habitat where the vole could come in contact with it. The vole is restricted to a single known site in the salt marsh of Waccasassa Bay, Levy County, Florida. This rodenticide is highly toxic to mammals, and would be lethal to voles if consumed. Because of the restricted distribution of the species, its limited population, and the likelihood of this rodenticide being used for rodent control in areas in which the vole may forage, it is the Service's biological opinion that the use of pival is likely to jeopardize the continued existence of the Florida salt marsh vole.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the species: prohibit use of pival within 100 yards of the landward edge of the species' salt marsh habitat in Levy County, Florida.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Fresno kangaroo rat, Tipton kangaroo rat - Because pival use is relatively restricted to non-habitat areas (registered for control of domestic rodents in and around buildings, and ground squirrel control in orchards, non-crop rights-of-way, and other developed areas such as parks and golf courses) the likelihood of exposure of these kangaroo rats to this compound appears to be somewhat limited. Nevertheless, Fresno and Tipton kangaroo rats may be vulnerable to periodic pival exposure because: (1) both species occupy habitats in which man-made structures (residences and agricultural buildings) exist nearby; and (2) both occasionally occupy right-of-way areas (e.g., aqueduct, canal, and levee embankments) where ground squirrel control is considered necessary. Furthermore, both species occupy highly restricted and/or fragmented habitats, and are highly susceptible to the toxic effects of this compound. Of registered formulations and applications, those most likely to adversely affect these kangaroo rats would be grain baits, broadcast applications, and applications to burrows. For these reasons, it is the Service's biological opinion that pival use within the range of the Fresno kangaroo rat and Tipton kangaroo rat is likely to jeopardize the continued existence of these species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Fresno kangaroo rat and Tipton kangaroo rat: (1) Prohibit all outdoor uses of pival grain baits within 100 yards of the occupied habitats of these species; (2) prohibit broadcast pival applications outdoors and pival applications to burrows within the ranges of these species; and (3) prohibit outdoor use of pival solid baits (granules, pellets, tablets, blocks) within the ranges of these species, unless a specific kangaroo rat protection program for solid pival baits, approved by the Service in writing, is implemented.

Incidental Take - Despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of the Fresno and Tipton kangaroo rat may occur as a result of pival use within the ranges of these species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Hualapai Mexican vole - The primary exposure of pival to the Hualapai Mexican vole would be through its application to control ground squirrels in non-crop rights-of-way or recreational areas. Voles are one of a number of target organisms of pival and also is highly toxic to small mammals. The likelihood that pival would be used in the habitat of the vole is small but if it were used because of the very small number of known voles, the consequences would be severe. Therefore, it is the Service's biological opinion that the use of pival is likely to jeopardize the continued existence of the Hualapai Mexican vole.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Hualapai Mexican vole: prohibit the use of pival within 100 yards of known Hualapai Mexican vole occupied habitat.

Incidental Take - With the implementation of the reasonable and prudent alternatives to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Jaguarundi and Ocelot - The primary exposure of pival to the ocelot and jaguarundi is through its use to control field rodents in orchards, groves and non-crop rights-of-way. This chemical is used in areas that are adjacent to or interspersed with known ocelot and jaguarundi habitat. There is little probability of these felids directly consuming the pival baits, however it is probable that secondary poisoning may occur as a result of these species consuming target rodents that have ingested pival. EPA has not provided adequate data relating to felids to evaluate the secondary poisoning hazard of pival. Sensitivities to indandiones often vary by orders of magnitude among taxa. Some indandiones are known to present a secondary poisoning to felids. Given the similar mode of action such a hazard must be considered a possibility for pival. Therefore, it is the Service's biological opinion that the use of pival is likely to jeopardize the continued existence of the ocelot and jaguarundi.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative will avoid jeopardy to the ocelot and jaguarundi: prohibit use within three miles of occupied habitat.

Incidental Take - Despite the implementation of the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of ocelot and jaguarundi may occur as a result of pival use within the range of these species.

Reasonable and Prudent Measure(s) - If implemented, the following reasonable and prudent measures will minimize incidental take: Prior to use of pival in potential ocelot or jaguarundi habitat, conduct survey to determine if habitat is occupied. If habitat is unoccupied, no further restrictions are applicable. If habitat is occupied, prohibit use within three miles.

Key Largo woodrat and Key Largo cotton mouse - Both the Key Largo woodrat and Key Largo cotton mouse occur in subtropical, evergreen, hardwood forests on the northern half of Key Largo, Monroe County, Florida, north of the point where U.S. Highway 1 enters Key Largo. Populations of both species may also occur in similar habitat on Lignumvitae Key, Monroe County, where the species were introduced in 1970. The Key Largo woodrat is primarily herbivorous, feeding mostly on buds, leaves, fruits, and seeds, but invertebrates occasionally are included in its diet. The diet of the Key Largo cotton mouse has not been documented, but it is believed to be very similar to that of the woodrat. The use of pival broadcast baits within or adjacent to habitat of these two species is likely due to the close proximity of various types of human development to the areas where these species occur. Exposure of the woodrat and cotton mouse to pival would result in direct mortality of individuals of the species. The most likely means of exposure of the woodrat and the cotton mouse to pival would be ingestion of broadcast baits. Accordingly, it is the Service's biological opinion that the registered use of pival is likely to jeopardize the continued existence of the Key Largo woodrat or Key Largo cotton mouse.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of the chemical within 100 yards of occupied habitat of the Key Largo woodrat and the Key Largo cotton mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Louisiana black bear - The Louisiana black bear may be exposed to pival by feeding on rodents or other animals that are dead or incapacitated from this rodenticide poison. Exposure may also occur by ingestion of meat and fish flavored baits. Bears venture into agricultural and other areas where this rodenticide is likely used and poisoned target animals would be found. This poison has been implicated in the deaths of raccoons, fox, rabbits, and mountain lion. EPA has not provided adequate data relating to large mammals to evaluate the secondary poisoning hazard of pival. Sensitivities to indandiones often vary by orders of magnitude among taxa. Some indandiones are known to present a secondary poisoning to felids. Given the similar mode of action of pival, such a hazard must be considered a possibility. Even if a bear ingested a sublethal dose of poison, rodenticide induced internal hemorrhaging could weaken a bear to the degree that the animal would be very susceptible to fatal disease or infections. Because of the bear's small population and restricted range, mortality resulting from rodenticide poisoning could threaten the survival of the species. Therefore, it is the Service's opinion that the use of pival is likely to jeopardize the continued existence of the Louisiana black bear.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Louisiana black bear: prohibit the use of the pesticide within the current known occupied habitat of the species.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Lower Keys rabbit - The Lower Keys rabbit could be exposed to pival when the rodenticide is used around buildings, rights-of-way, and other open areas that are adjacent to the rabbit's marsh habitat. The rabbit is likely to forage in some treated areas. Continued rapid development in the lower Keys greatly increases the potential that the rabbit would come in contact with rodenticide treated areas. Broadcast applications of flavored baits would pose a serious threat to the species. This rodenticide would be lethal to Lower Keys rabbits if it were ingested. Because of the extremely restricted range of the species and its small population, any rodenticide induced poisonings could threaten the survival of the species. Therefore, it is the opinion of the Service that the use of pival is likely to jeopardize the continued existence of the Lower Keys rabbit.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Lower Keys rabbit: prohibit the outdoors use of the chemical within 100 yards of the current known occupied habitat of the species.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Morro Bay kangaroo rat - The primary exposure of pival from registered uses can occur when the Morro Bay kangaroo rat ingests treated bait. The extremely limited range of this species, the presence of target rodents, and the interspersed habitat of this species with urban, agricultural,

and commercial buildings place the Morro Bay kangaroo rat at risk. It is the biological opinion of the Service that use of pival is likely to jeopardize the continued existence of the Morro Bay kangaroo rat.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Morro Bay kangaroo rat: prohibit the use of pival within 100 yards of the occupied habitat of the Morro Bay kangaroo rat.

Incidental Take - With implementation of the reasonable and prudent alternative described above, no incidental take is anticipated and therefore none is authorized.

Point Arena mountain beaver, salt marsh harvest mouse - These species may be subject to pival exposure because use patterns of this chemical (registered for domestic rodent control in and around buildings, and for ground squirrel control in orchards, non-crop rights-of-way, and other developed areas) may include some harvest mice or mountain beaver habitats or areas adjacent to such habitats. Both these species occupy areas in which man-made structures or sites exist nearby (commercial and industrial buildings in the vicinity of San Francisco Bay salt marshes, municipal and communication structures in the Point Arena vicinity, golf courses and similar sites in both areas). Adverse effects of pival use on the harvest mouse and mountain beaver could be significant because: (1) both species may be attracted to grain or pelletized pival baits if applied in the vicinity of occupied habitats; (2) both are highly susceptible to the toxic effects of this compound; and (3) the habitats of these species are highly restricted and fragmented. It is therefore the Service's biological opinion that pival use within the ranges of the salt marsh harvest mouse and Point Arena mountain beaver is likely to jeopardize the continued existence of these species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the salt marsh harvest mouse: prohibit outdoor pival use within 100 yards of the occupied habitat of this species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Point Arena mountain beaver: (1) Prohibit broadcast pival applications outdoors and pival applications to burrows within the occupied habitat of this species; and (2) prohibit outdoor pival use (all baits) within the occupied habitat of this species, unless a specific mountain beaver protection program for pival use, approved by the Service in writing, is implemented.

Incidental Take - Despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of the salt marsh harvest mouse and Point Arena mountain beaver may occur as a result of pival use within the ranges of these species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

San Joaquin kit fox - This species may be subject to pival exposure because use patterns of this chemical (registered for domestic rodent control in and around buildings, and for ground squirrel

control in orchards, non-crop rights-of-way, and other developed areas) include numerous areas that may be frequented by kit foxes. Such areas within the kit fox range include several municipalities (e.g., Bakersfield, California), oil fields, aqueduct and canal embankments, golf courses, and orchards. There are two potential sources of kit fox exposure to pival: (1) direct consumption of pival baits (possible especially for pelletized and other solid bait formulations, especially when broadcast or applied at burrows); and (2) secondary poisoning by consuming small mammals killed or incapacitated by pival exposure. EPA considers the possibility of secondary poisoning of kit foxes to be low. However, the Service questions whether the data on which EPA makes this assumption is applicable to canid species. Adverse effects of pival use on the San Joaquin kit fox therefore could be significant because (1) of the wide variety of pival use patterns and formulations; (2) the opportunistic feeding habitats of kit foxes, which increases the likelihood of exposure; (3) the fact that serious localized effects of pival use could occur in areas where the kit fox range is geographically restricted; and (4) the possibility of secondary effects. For these reasons, the Service concludes that pival use within the San Joaquin kit fox range is likely to jeopardize the continued existence of this species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the San Joaquin kit fox: prohibit pival use within the kit fox range as determined by the Service. Exceptions to this prohibition are as follows: (1) Agricultural areas that are one mile or more from any kit fox habitat, such areas to be determined and mapped by the California Environmental Protection Agency in consultation with the Service, or to be determined by the Service. For purposes of this alternative, kit fox habitat is defined as all native lands and rangelands within the kit fox range whether disturbed or undisturbed, agricultural lands known or likely to be occupied by kit foxes (e.g., orchards, fallow lands), and all urban and municipal areas within Kern and Tulare Counties; OR (2) areas for which kit fox surveys have been conducted within a one mile radius of proposed treatment sites and have yielded negative results, provided such surveys are conducted by qualified individuals utilizing methods acceptable to the Service, and that such results are submitted to the Service for review and approval; OR (3) laboratory data acceptable to the Service demonstrates negligible risks to canid species resulting from secondary pival exposure. If the latter is completed, a specific kit fox protection program for pival use within the kit fox range may be implemented, provided that the Service approves of any such program in writing.

Incidental Take - Despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of the San Joaquin kit fox may occur as a result of pival use within the range of this species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Silver rice rat - The silver rice rat could be exposed to pival when the rodenticide is used (for control of black and Norway rats, and house mice) around buildings, rights-of-way, ditches, and other open areas that are adjacent to the rat's wetland habitat. The rat is likely to forage in some treated areas. Continued rapid development in the lower Keys greatly increases the potential that the rat would come in contact with rodenticide treated areas. Broadcast applications of flavored baits would pose a serious threat to the species. This rodenticide would be lethal to silver rice

rats if it were ingested. Because of the extremely restricted range of the species and its small population, any rodenticide induced poisonings could threaten the survival of the species. Therefore, it is the opinion of the Service that the use of pival is likely to jeopardize the continued existence of the silver rice rat.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the silver rice rat: prohibit the outdoors use of the chemical within 100 yards of the current known occupied habitat of the species.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Stephen's kangaroo rat - The primary exposure of the Stephen's kangaroo rat to pival is the ingestion of the many bait formulations placed in proximity to the occupied habitat of this species including around buildings, groves, golf courses, and non-crop rights-of-way. It is the biological opinion of the Service that use of pival is likely to jeopardize the continued existence of the Stephen's kangaroo rat.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Stephen's kangaroo rat: (1) Prohibit all outdoor uses of pival grain baits within the 100 yards of the occupied habitat of this species; (2) prohibit broadcast pival applications outdoors and pival applications to burrows within the occupied habitat of this species; and (3) prohibit outdoor use of pival solid baits (granules, pellets, tablets, blocks) within the occupied habitat of this species, unless a specific kangaroo rat protection program for solid pival baits, approved by the Service in writing, is implemented.

Incidental Take - Despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of the Stephen's kangaroo rat may occur as a result of pival use within the ranges of this species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Audubon's crested caracara - Audubon's crested caracara may be exposed to pival by secondary poisoning from consuming contaminated rodents. EPA did not provide adequate data relating to secondary poisoning of birds from pival. Some indandiones are known to present a secondary poisoning hazard to birds. Given the similar mode of action of pival, such a hazard must be considered a possibility. Caracaras feed both on carrion and live prey. Pival is registered for use in pastures and rangeland. Caracaras occur in open prairies and frequently use improved pastures. Since it takes several days for death to occur from pival ingestion, it is conceivable that poisoned rodents may travel away from the baited area to die. Because of the caracara's small population size, any rodenticide induced mortality could threaten the survival of the species. Therefore, it is the Service's opinion that the use of pival is likely to jeopardize the continued existence of the Audubon's crested caracara.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Audubon's crested caracara: prohibit the use of the pesticide within the current occupied range of the species.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

RATIONALE FOR NO JEOPARDY DETERMINATIONS

Giant kangaroo rat - Giant kangaroo rats may be subject to periodic pival exposure in some habitats that are adjacent to human activities and structures where this compound may be used. Primarily, such areas would include oil fields where industrial structures may be present and rights-of-way in the southwest and west central portions of the San Joaquin Valley and Carrizo Plain, California. Of registered formulations and applications, those most likely to adversely effect giant kangaroo rats would be grain baits, broadcast applications, or applications directly to burrows. However, much of the giant kangaroo rat range is well removed from areas where pival use is anticipated. Therefore, the Service concludes that pival use within the giant kangaroo rat range is not likely to jeopardize the continued existence of this species.

Incidental Take - Although possible exposure of the giant kangaroo rat to pival probably is minimal, the Service anticipates that an unquantifiable level of incidental take may occur as a result of pival use within the range of these species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the giant kangaroo rat will be minimized: (1) Prohibit all outdoor uses of pival grain baits within 100 yards of the occupied habitat of this species; (2) prohibit broadcast pival applications outdoors and pival applications to burrows within the occupied habitat of this species; and (3) prohibit outdoor use of pival solid baits (granules, pellets, tablets, blocks) within the occupied habitat of this species, unless a specific giant kangaroo rat protection program for pival use, approved by the Service in writing, is implemented.

Utah prairie dog - The primary exposure of pival to this species may be from its registered uses to control voles in noncrop rights-of-way and other noncrop areas. EPA determined that pival may affect the Utah prairie dog which may consume pival bait. However, registered uses of this pesticide would impact only a very small portion, if any, of the population where there may be prairie dog colonies occurring near rights-of-way where vole control may take place. Therefore, it is the Service's opinion that the use of pival is not likely to jeopardize the continued existence of the Utah prairie dog.

Incidental Take - Because pival is toxic to small mammals feeding on pival bait, the Service anticipates that an unquantifiable level of incidental take may occur as a result of the use of pival to control voles in rights-of-way.

Reasonable and Prudent Measure(s) - The following reasonable and prudent measures for minimizing incidental take and implementing terms and conditions should be adopted: prohibit the application of pival within 100 yards of occupied Utah prairie dog habitat.

Eastern indigo snake - The eastern indigo snake would only be exposed to pival by eating an animal such as a mouse or rat that had been poisoned by the rodenticide. Indigo snakes occasionally occur in agricultural areas where rodenticides are likely to be used. Although EPA has no toxicity data for reptiles, the data on birds is considered applicable to reptiles. EPA did not provide adequate data relating to secondary poisoning of birds from pival. Some indandiones are known to present a secondary poisoning hazard to birds. Sensitivities to indandiones often vary by orders of magnitude among taxa. Some indandiones are known to present a secondary poisoning to birds. Given the similar mode of action of pival, such a hazard must be considered a possibility however minimal. Therefore, it is the Service's opinion that the use of pival is not likely to jeopardize the continued existence of the eastern indigo snake.

Incidental Take - Although the chance of exposure is considered minimal, because of the high toxicity of pival, it is still a matter of concern. Thus, the Service anticipates that an unquantifiable level of incidental take may occur as a result of this chemical's use in areas where the eastern indigo snake may occur.

Reasonable and Prudent Measure(s) - The following reasonable and prudent measure for minimizing incidental take should be adopted: conduct laboratory studies using surrogate snake species to obtain toxicity data on the chemical's secondary poisoning hazard to snakes. Based on the data generated by the studies, the Service will develop and revise the reasonable and prudent measures. (Because of the status and relatively broad geographic range of this species of indigo snake, the Service believes at this time that prohibiting the use of pival within the species' occupied habitat would not be reasonable and prudent).

Potassium nitrate and Sodium nitrate

CHEMICAL INFORMATION

TYPE: Rodenticide

FORMULATION: Poisonous gas cartridges. Nitrates in cartridges range from 44% to 54% ai.

REGISTERED USES: Lawns, gardens, golf courses, cemeteries, open fields, rights-of-way and rangeland. For use only in burrows to control pocket gophers, moles, woodchucks, rats, prairie dogs, skunks and ground wasps.

BACKGROUND:

Mode of action: Suffocation

Aquatic toxicity: EPA did not provide any aquatic toxicological data on fish and invertebrates, but states, because of the method of application and extreme volatility, the use of these two chemicals will not affect aquatic organisms.

Terrestrial toxicity: The gas given off by these products are extremely toxic to any animal sealed in a burrow. Effectiveness may vary depending on burrow size, openings and soil texture and moisture. These two chemicals produce no toxic residues after the cartridge has burned. Since these two products produce a deadly gas, any listed species trapped in burrows will be killed. Consistent with use pattern and volatility of gas, no direct or indirect impacts should occur for listed plants and/or plant pollinators considered in this consultation.

Wildlife incidents: None reported.

BIOLOGICAL OPINION

CHEMICAL REFERENCE TABLE

(The following table contains only those species for which the Service provided a jeopardy or no jeopardy call. Species not included in this list are either not affected by the chemical or have no chance for exposure. For a complete list of all species considered in this opinion, refer to the master species list on page III-1 of the species profile section.)

Species Name	J/NJ	PAGE
MAMMALS		
Black-footed ferret	J	72
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Species Name	J/NJ	PAGE
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RATIONALE FOR JEOPARDY DETERMINATIONS

Black-footed ferret - These two pesticides are registered for uses on lawns, gardens, golf courses, cemeteries, open fields, rights-of-way, and rangeland to control pocket gophers, moles, woodchucks, rats, prairie dogs, skunks, and ground wasps. These pesticides are placed inside burrows and sealed giving off poisonous gas which kills all the inhabitants in the burrows. The likelihood of ferrets being found in the wild, while considered low, is still possible. The further loss or fragmentation of prairie dog habitat which has already been reduced by as much as 98 percent (from over 100 million acres to around 2 million acres) as well as the loss of a single ferret in the wild could result in the extinction of the species. Therefore, it is the Service's opinion that the use of sodium nitrate and potassium nitrate is likely to jeopardize the continued existence of the black-footed ferret.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the black-footed ferret:

1. A black-tailed prairie dog colony or complex of less than 80 acres having no neighboring prairie dog towns may be treated without a ferret survey. A midrange of 102 acres (61 to 294 acres) of occupied black-footed prairie dog habitat is believed necessary to support a single ferret, so it is highly unlikely that a ferret would be found in an isolated colony of less than 80 acres. A neighboring prairie dog town is defined as a colony less than 7 kilometers (4.34 miles) from the town to be treated, based on the longest distance that the ferret has been observed to travel during the night.
2. A white-tailed prairie dog colony or complex of less than 200 acres having no neighboring prairie dog towns may be treated without a survey. It is estimated to require between 196 and 475 acres of white-tailed prairie dogs to support a single ferret.
3. Urban situations (e.g., playgrounds, golf courses, etc.) may be treated without conducting ferret surveys. The appropriate Service office will be contacted by the pesticide user in advance of any treatment to determine whether a proposed action fits this situation.

4. For black-tailed prairie dog colonies or complexes over 80 acres but less than 1,000 acres, and white-tailed prairie dog colonies or complexes over 200 acres but less than 1,000 acres, prairie dog control may be allowed after completing a black-footed survey within 30 days of proposed treatments on colonies proposed for treatment, provided no ferrets or their sign are found. Prior to treatment, if all colonies in this complex are surveyed with no sign of ferrets, no future survey for ferrets would be recommended. These surveys will be coordinated with the appropriate Office of the Service.

5. For prairie dog complexes over 1,000 acres, no control shall be allowed until the complex has been evaluated by appropriate State and/or Federal Agencies (those agencies working on State working groups for ferret recovery) for its potential as a recovery site and until the complex has been block cleared. One thousand acres would be a minimum complex for consideration as a black-footed ferret reintroduction site and would likely require intensive management of habitat for a ferret population.

6. The EPA shall maintain records which shall be provided to the Service on an annual basis. These records can include the amount of acres of prairie dog towns or complexes controlled (e.g., Federal lands, private lands on a volunteer basis), or the amount of the chemical sold including application rates. The latter could be obtained from either the manufacturer or the vender.

Surveys shall be supervised by biologists trained in ferret survey techniques and ferret biology at a Service-approved training workshop. Currently, only the University of Wyoming has such a course. Ferret surveys shall be reviewed by the Service for compliance with survey standards and Section 7 of the Endangered Species Act.

Incidental Take - With the implementation of the reasonable and prudent alternatives to preclude jeopardy of the black-footed ferret, no incidental take is anticipated and thus none is authorized.

Fresno kangaroo rat, giant kangaroo rat, Tipton kangaroo rat - The primary risk of potassium and sodium nitrate exposure for these species would result from registered uses of these compounds as burrow fumigants in the southern San Joaquin Valley, California. The most likely source of exposure would be inadvertent application to kangaroo rat burrows during control of field rodents in occupied habitats. This risk may be minimized by the fact that kangaroo rat burrows differ somewhat in appearance from burrows of target species. Nevertheless, adverse effects of potassium and sodium nitrate use on Fresno, giant, and Tipton kangaroo rats could be significant because of: (1) their high toxicity (100 percent mortality in treated burrows is expected); (2) the frequency of ground squirrel control programs in areas occupied by these species; and (3) the fact that each of these kangaroo rats occupy habitats that are significantly restricted and/or fragmented. For these reasons, it is the Service's biological opinion that use of potassium and sodium nitrate is likely to jeopardize the continued existence of these species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Fresno kangaroo rat, giant kangaroo rat, and Tipton kangaroo rat: to avoid application to kangaroo rat burrows, potassium and sodium nitrate shall be used within the occupied habitats of these species only by qualified individuals. Such persons shall be limited to wildlife biologists, certified applicators, or agents of county agricultural commissioner offices, university extension offices, or representatives of California State or Federal agencies, who are trained to distinguish dens and burrows of target species from those of non-target species.

Incidental take - Despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take may occur as a result of potassium and sodium nitrate use within the ranges of these species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Hualapai Mexican vole - The primary exposure of sodium nitrate and potassium nitrate to the Hualapai Mexican vole would be through its application to control ground squirrels in non-crop rights-of-way or recreational areas. Voles are one of a number of target organisms of sodium nitrate and potassium nitrate and also is highly toxic to small mammals. The likelihood that sodium nitrate and potassium nitrate would be used in the habitat of the vole is small but if it were used because of the very small number of known voles, the consequences would be severe. Therefore, it is the Service's biological opinion that the use of sodium nitrate and potassium nitrate is likely to jeopardize the continued existence of the Hualapai Mexican vole.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Hualapai Mexican vole: prohibit the use of sodium nitrate and potassium nitrate in occupied habitat of the Hualapai Mexican vole.

Incidental Take - With the implementation of the reasonable and prudent alternatives to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Morro Bay kangaroo rat - The primary exposure of potassium nitrate and sodium nitrate from registered uses can occur either when Morro Bay kangaroo rat burrows are targeted or the burrows of targeted animals contain the species. The extremely limited range of this species and the presence of target control species places the Morro Bay kangaroo rat at risk. It is the biological opinion of the Service that use of sodium or potassium nitrate is likely to jeopardize the continued existence of the Morro Bay kangaroo rat.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit the use of potassium nitrate and sodium nitrate within the occupied habitat of the Morro Bay kangaroo rat.

Incidental Take - With implementation of the reasonable and prudent alternative described above, no incidental take is anticipated and therefore none is authorized.

Point Arena mountain beaver - This species is vulnerable to potassium and sodium nitrate exposure during registered uses of these burrow fumigants in Mendocino County, California. The primary source of exposure would result from inadvertent application to mountain beaver burrows during control of field rodents in occupied habitats. Adverse effects of potassium and sodium nitrate use on the Point Arena mountain beaver could be significant because of: (1) the high toxicity of these fumigants; (2) the frequency of rodent control programs within the range of this species; and (3) the fact that the mountain beaver occupies highly restricted and fragmented habitats. For these reasons, it is the Service's biological opinion that use of potassium and sodium nitrate within the range of the Point Arena mountain beaver is likely to jeopardize the continued existence of this species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Point Arena mountain beaver: To avoid application to mountain beaver burrows, potassium and sodium nitrate shall be used within the mountain beaver's occupied habitat only by qualified individuals. Such persons shall be limited to wildlife biologists, certified applicators, or agents of county agricultural commissioner offices, university extension offices, or representatives of California State or Federal agencies, who are trained to distinguish dens and burrows of target species from those of non-target species.

Incidental take - Because of the possibility of inadvertent application of these compounds to mountain beaver burrows despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take may occur as a result of potassium and sodium nitrate use within the range of this species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

San Joaquin kit fox - The primary source of kit fox exposure to potassium and sodium nitrate would result from erroneous application of these fumigants to kit fox dens during control of rodents, primarily ground squirrels, in the San Joaquin Valley, California. The possibility of such error is especially high for kit foxes because kit fox dens and ground squirrel burrows often have similar dimensions at the ground surface. Though the kit fox is relatively wide-ranging, potassium and sodium nitrate uses could have significant adverse effects on this species because of: (1) the extremely high toxicity of these fumigants (100 percent mortality in treated burrows is expected); (2) the frequency of ground squirrel control programs within the kit fox range; and (3) the fact that serious localized effects of potassium and sodium nitrate use could occur in areas where the kit fox range is geographically restricted (e.g., the north end of the range where kit foxes are confined to a narrow strip of rangelands, and the Santa Nella area where the range forms a "bottleneck"). For these reasons, it is the Service's biological opinion that potassium and sodium nitrate use within the San Joaquin kit fox range is likely to jeopardize the continued existence of this species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the San Joaquin kit fox: To avoid

application to kit fox dens, potassium and sodium nitrate shall be used within the San Joaquin kit fox's range only by qualified individuals. Such persons shall be limited to wildlife biologists, certified applicators, or agents of county agricultural commissioner offices, university extension offices, or representatives of California State or Federal agencies, who are trained to distinguish dens and burrows of target species from those of non-target species.

Incidental Take - Because of the possibility of inadvertent application of these compounds to kit fox dens despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of San Joaquin kit foxes may occur as a result of potassium and sodium nitrate use within the range of this species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Stephen's kangaroo rat - The primary exposure of potassium nitrate and sodium nitrate from registered uses can occur either when Stephen's kangaroo rat burrows are targeted or the burrows of targeted animals contain the species. It is the biological opinion of the Service that use of sodium or potassium nitrate is likely to jeopardize the continued existence of the Stephen's kangaroo rat.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Stephen's kangaroo rat: prohibit the use of potassium and sodium nitrate in the occupied habitat of the Stephen's kangaroo rat or potassium and sodium nitrate shall be used within this species's occupied habitat only by qualified individuals. Such persons shall be limited to wildlife biologists, certified applicators, or agents of county agricultural commissioner offices, university extension offices, or representatives of California State or Federal agencies, who are trained to distinguish dens and burrows of target species from those of non-target species.

Incidental Take - With implementation of the reasonable and prudent alternative described above, no incidental take is anticipated and therefore none is authorized.

Blunt-nosed leopard lizard, San Francisco garter snake - The blunt-nosed leopard lizard and San Francisco garter snake utilize burrows for all or part of their life cycle, and therefore are subject to potassium and sodium nitrate exposure during registered uses of these compounds as burrow fumigants within occupied habitats (San Joaquin Valley and San Francisco Bay area, California, respectively). However, because leopard lizards and garter snakes do not construct their own burrows but utilize existing burrows of other species (usually mammals), avoidance of exposure to potassium and sodium nitrate through burrow identification is difficult. The leopard lizard is subject to such exposure year round, since it utilizes burrows during its activity and hibernation phases. The garter snake utilizes burrows only during its hibernation phase (approximately November through March) and is subject to exposure only during this period. Because of the high toxicity of these burrow fumigants, the likelihood of exposure, and the fact that these species occupy highly restricted and/or fragmented habitats, it is the biological opinion of the Service that

potassium and sodium nitrate use is likely to jeopardize the continued existence of the blunt-nosed leopard lizard and San Francisco garter snake.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the blunt-nosed leopard lizard: (1) To avoid application to leopard lizard burrows, potassium and sodium nitrate shall be used within the blunt-nosed leopard lizard range only by qualified individuals; such persons shall be limited to wildlife biologists, certified applicators, or agents of county agricultural commissioner offices, university extension offices, or representatives of California State or Federal agencies, who are trained to distinguish dens and burrows of target species from those of non-target species. (2) From April 15 to September 30, potassium and sodium nitrate use within the blunt-nosed leopard lizard range shall be limited to daylight hours when air temperatures are between 77 and 95 degrees Fahrenheit (20 to 30 degrees Centigrade). (3) Potassium and sodium nitrate use shall be prohibited within occupied leopard lizard habitat during the leopard lizard inactivity period, October 1 to April 15, unless a specific blunt-nosed leopard lizard protection program for this period, approved in writing by the Service, is implemented.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the San Francisco garter snake: (1) To avoid application to garter snake burrows, potassium and sodium nitrate shall be used within the San Francisco garter snake range only by qualified individuals; such persons shall be limited to wildlife biologists, certified applicators, or agents of county agricultural commissioner offices, university extension offices, or representatives of California State or Federal agencies, who are trained to distinguish dens and burrows of target species from those of non-target species. (2) Potassium and sodium nitrate use within occupied San Francisco garter snake habitat shall be prohibited during the garter snake inactivity period, November 1 to March 30, unless a specific San Francisco garter snake protection program for this period, approved in writing by the Service, is implemented.

Incidental Take - Because of the possibility of inadvertent application of these compounds to burrows inhabited by leopard lizards and garter snakes despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take may occur as a result of sodium and potassium nitrate use within the ranges of these species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Eastern indigo snake - The eastern indigo snake would most likely be exposed to sodium nitrate and potassium nitrate when these rodenticide chemicals are used to fumigate rodent burrows. Indigo snakes use burrows for shelter particularly during the winter season. The snake typically uses gopher tortoise burrows when they are available, but the snake is opportunistic when seeking shelter and would use rodent burrows if necessary. The chemical gas produced by these nitrate rodenticides would be lethal to any animal inhaling the gas inside a burrow. Because the eastern indigo snake population is relatively small and declining, and the fact that these snakes frequent

agricultural areas where the nitrate fumigants would likely be used, it is the Service's opinion that the use of sodium nitrate and potassium nitrate fumigants is likely to jeopardize the continued existence of the species.

Reasonable and Prudent Alternative(s) - The following reasonable and prudent measure for minimizing incidental take should be adopted: prohibit the use of these fumigants in animal burrows within habitat types and locales known to support indigo snakes.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Gopher tortoise - The gopher tortoise would most likely be exposed to sodium nitrate and potassium nitrate when these rodenticide chemicals are used to fumigate rodent burrows. Gopher tortoises use burrows for shelter. Tortoise burrows may be found in agricultural areas where land owners may use fumigants. The chemical gas produced by these nitrate rodenticides would be lethal to any animal inhaling the gas inside a burrow. Because tortoise population is relatively small and declining, and the fact that these reptiles occur in agricultural areas where the nitrate fumigants would likely be used, it is the Service's opinion that the use of sodium nitrate and potassium nitrate fumigants is likely to jeopardize the continued existence of the gopher tortoise.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would jeopardize the gopher tortoise: prohibit the use of the chemical in or adjacent to known gopher tortoise occupied habitat west of the Mobile and Tombigbee Rivers in Alabama.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

RATIONALE FOR NO JEOPARDY DETERMINATIONS

Utah prairie dog - Both potassium nitrate and sodium nitrate are registered for uses on lawns, gardens, golf courses, cemeteries, open fields, rights-of-way, and rangeland to control pocket gophers, moles, woodchucks, rats, prairie dogs, skunks, and ground wasps. The EPA label for the use of dexol gopher gasser requires that this product not be used in the range of the Utah prairie dog. However, it is not known whether this endangered species label is required for other uses on products of these two pesticides. Because there is restricted use on at least some of the pesticide uses (e.g., dexol gopher gasser), it is the Service's opinion that the use of potassium nitrate and sodium nitrate is not likely to jeopardize the continued existence of the Utah prairie dog.

Incidental Take - Because information provided by EPA restricts the use of these two pesticides only on dexol gopher gasser, the Service anticipates that an unquantifiable level of incidental take may occur as a result of the potassium nitrate and sodium nitrate for prairie dog control.

Reasonable and Prudent Measure(s) - To minimize incidental take, the following measures should be adopted: prohibit the use of potassium nitrate and sodium nitrate within occupied Utah prairie dog habitat.

Desert tortoise - There is potential exposure of potassium nitrate and sodium nitrate from registered application for rodents since tortoise burrows, though they are much larger in size, may be accidentally treated. It is the Service's biological opinion that use of potassium nitrate and sodium nitrate is not likely to jeopardize the continued existence of the desert tortoise.

Incidental Take - The service anticipates that an unquantifiable level of incidental take may occur as a result of potassium and sodium nitrate use within the occupied habitat of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the desert tortoise will be minimized: sodium and potassium nitrate shall be used within the desert tortoise occupied habitat only by qualified individuals. Such persons shall be limited to wildlife biologists, certified applicators, or agents of county agricultural commissioner offices, university extension offices, or representatives of California State or Federal agencies, who are trained to distinguish dens and burrows of target species from those of non-target species.

Coachella Valley fringe-toed lizard - The primary effect of potassium nitrate and sodium nitrate would be due to an interface when burrows harboring the lizards are treated. It is the biological opinion of the Service that use of sodium and potassium nitrate is not likely to jeopardize the continued existence of the Coachella Valley fringe-toed lizard.

Incidental Take - The service anticipates that an unquantifiable level of incidental take may occur as a result of potassium and sodium nitrate use within the occupied habitat of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the Coachella Valley fringe-toed lizard will be minimized: prohibit the use of potassium and sodium nitrate use within the occupied habitat of the Coachella fringe-toed lizard.

Island night lizard - There is potential exposure to this species by sodium and potassium nitrate from registered application for rodents due to the use of rodent burrows by the island night lizard. It is the Service's biological opinion that use of sodium and potassium nitrate is not likely to jeopardize the continued existence of the island night lizard.

Incidental Take - The service anticipates that an unquantifiable level of incidental take may occur as a result of sodium and potassium nitrate use within the occupied habitat of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the island night lizard will be minimized: prohibit the use of sodium and potassium nitrate within the occupied habitat of this species.

Sodium cyanide

CHEMICAL INFORMATION

TYPE: Canid predacide

FORMULATION: Capsules (888mg sodium cyanide (NaCN), 89%ai) contained in an M-44 device.

REGISTERED USES: Control of coyotes, red foxes, gray foxes and feral dogs. M-44 use is subject to 26 restrictions designed to protect the applicator, human health, livestock, and non-target wildlife. Registered for use only by the following agencies: U. S. Department of Agriculture's Animal and Plant Health Inspection Service (Hyattsville, MD), Texas Department of Agriculture, (Austin), Montana Department of Livestock (Helena), Wyoming Department of Agriculture (Cheyenne), Navajo Fish and Wildlife Department (Window Rock, AZ), New Mexico Department of Agriculture, (Las Cruces) and the Kansas Department of Wildlife and Parks (Pratt). All other NaCN products for mammalian predator control have been canceled and uses suspended.

BACKGROUND:

Mode of action: Converts to hydrogen cyanide gas which poisons by inactivating an enzyme essential to mammalian cellular respiration leading to central nervous system depression, cardiac arrest, and gross respiratory failure (Ballantyne 1987).

Aquatic toxicity: NaCN is highly soluble in water (480 g/L at 10°C; Eisler 1991) but completely dissociates to give free cyanide which, depending on pH, forms highly toxic hydrogen cyanide (HCN). HCN does not tend to bioaccumulate in aquatic organisms. Likewise, cyanide seldom remains biologically available in soils because it is either complexed by trace metals, metabolized by microorganisms, or lost through volatilization (Eisler 1991). Cyanide is highly to very highly toxic to most aquatic organisms. In general, fish were the most sensitive aquatic organisms tested under controlled conditions (Eisler 1991).

Cyanide acts rapidly in aquatic environments, does not persist for extended periods, and is highly species selective. Organisms usually recover quickly on removal to clean water. The critical sites for cyanide toxicity in freshwater organisms are the gills, egg capsules, and other sites where gaseous exchange and osmoregulatory processes occur (Eisler 1991). The M-44 NaCN capsules may not be used within 200 feet of water and the number of capsules that may be used is limited to a maximum of 20 per square mile. Therefore, cyanide from M-44 capsules should pose negligible hazard to aquatic organisms.

Terrestrial toxicity: NaCN is highly to very highly toxic to birds and mammals. The M-44 NaCN ejector device should be considered to have 100% efficacy. The M-44 is designed to eject a burst of crystalline NaCN into the face of a predator tugging at the bait. On contact with mucus or saliva of the eyes, nose, and mouth, hydrogen cyanide is immediately formed and the gas readily absorbed through the highly permeable membranes of the nose, mouth, lungs, and stomach.

In an avian study of acute oral toxicity, three flesh-eating species (black vulture, American kestrel, and eastern screech-owl; $LD_{50}s = 4.0-8.6 \text{ mg/kg}$) were more sensitive to NaCN than three species (Japanese quail, European starling, and domestic chicken; $LD_{50}s = 9.4-21 \text{ mg/kg}$) that fed predominantly on plant material (Wiemeyer et al. 1986). It was also noted that the associated dose-response curve was consistently steepest for the flesh-eaters and thereby suggests further increase in hazard to species most likely to trip an M-44 cyanide ejector device.

EPA lists a number of "may affect" mammals such as the San Joaquin kit fox, jaguar, ocelot, gray wolf, and the Mariana crow. However, it is EPA's position that adherence to the 26 conditions effectively eliminates the non-target hazards associated with the use of M-44 cyanide capsules. Conversely, it is clear from Connolly's (1988) list of non-target species that any carrion feeding animal able to activate the trigger of the M-44s cyanide ejector device is at risk. Consistent with its use pattern, no direct or indirect effects are expected with M-44 cyanide capsules with respect to listed plants and/or plant pollinators considered in this consultation.

Wildlife incidents: EPA reported no wildlife poisoning incidents associated with NaCN. However, when the M-44 user is in compliance with the 26 specific restrictions, the likelihood of the general public locating the carcass of a non-target species is small. Many of the Animal Damage Control non-target listings (Connolly 1988) would have constituted "wildlife incidents" if located first by the general public. Also, a dead California condor was exposed to NaCN from an M-44 even though a conclusive diagnosis of death was not made (Wiemeyer et al. 1986).

The U. S. Department of Agriculture's Animal Damage Control program records mortality from M-44 cyanide ejector use. During 1976-1986, M-44s were used in 14 western states, killing 103,255 animals. This total includes 4,868 non-target animals (Connolly 1988). Non-target species reported killed include grizzly bear, black bear, mountain lion, badger, kit and swift fox, bobcat, ringtail cat, feral cat, skunk, opossum, raccoon, Russian boar, feral hog, javelina, beaver, porcupine, nutria, rabbit, vulture, raven, crow, and hawk. It is reasonable to believe birds deaths are underestimated in non-target kill reports because the bird's flight response on activation of an M-44 could easily remove them from the vicinity of the device in a few seconds.

BIOLOGICAL OPINION

CHEMICAL REFERENCE TABLE

(The following table contains only those species for which the Service provided a jeopardy or no jeopardy call. Species not included in this list are either not affected by the chemical or have no chance for exposure. For a complete list of all species considered in this opinion, refer to the master species list on page III-1 of the species profile section.)

Species Name	J/NJ	PAGE
MAMMALS		
Florida panther	J	83
Gray wolf	NJ	85
Grizzly bear	NJ	85
Jaguarundi	J	83
Louisiana black bear	J	84
Ocelot	J	83
San Joaquin kit fox	J	85

Species Name	J/NJ	PAGE
BIRDS		
Alala (Hawaiian crow)	NJ	86
California condor	J	85
Mariana crow	NJ	86

RATIONALE FOR JEOPARDY DETERMINATIONS

Florida panther - The panther could be exposed to sodium cyanide when the chemical is used in an M-44 device to control canid predators such as foxes and feral dogs. EPA requires a number of restrictions on the use of the device, which would minimize the opportunity of an endangered species coming in contact with the M-44 device. According to EPA, the M-44 shall not be used in areas where endangered species may be adversely affected. However, the panther requires a large home range, and at times will venture from that range in search of prey. Young panthers will also disperse to establish new home range territory. Consequently, there is opportunity for panthers to be exposed to an M-44 device. Although these sodium cyanide devices are designed for canid control, there are documented kills of bobcats and mountain lions. Because of the critically small panther population, any poisoning event could threaten the survival of the species. Therefore, it is the Service's opinion that the use of sodium cyanide is likely to jeopardize the continued existence of the Florida panther.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Florida panther: prohibit the use of the chemical device within 20 miles of the boundary of any Federal and State lands (e.g., National Wildlife Refuge, National Park, National Preserve, State Park, State Preserve, State Wildlife Management Areas, etc.) and Indian Reservations that provide suitable panther habitat south of Charlotte, Glades and Martin Counties, Florida.

Incidental Take - Because individuals of the species may disperse beyond a given home range, the use and toxicity of the pesticide is still a concern. Consequently, the Service anticipates that an unquantifiable level of incidental take may occur as a result of the use of the pesticide outside of the prohibited use zone.

Reasonable and Prudent Measure(s) - The following reasonable and prudent measure for minimizing incidental take should be adopted and implemented: prohibit the use of sodium cyanide (M-44s) in the geographic range of the Florida panther until after the user has contacted the local Fish and Wildlife Service office and that office has determined that there are no known panthers in the general vicinity of where the M-44's are going to be used.

Jaguarundi and Ocelot - The ocelot and jaguarundi could be exposed to sodium cyanide when the chemical is used in an M-44 device to control canid predators such as foxes, coyote and feral dogs. EPA requires a number of restrictions on the device, which would minimize the opportunity of an endangered species coming in contact with the M-44 device. According to EPA, the M-44 shall not be used in areas where endangered species may be adversely affected. However, young ocelots and jaguarundi will disperse in an attempt to establish new territories and could be exposed to an M-44 device. Although these sodium cyanide devices are designed for canid control, there are documented kills of bobcats and mountain lions. Because of the critically small

ocelot and jaguarundi populations, any poisoning event could threaten the survival of the species. Therefore, it is the Service's opinion that the use of sodium cyanide is likely to jeopardize the continued existence of the ocelot and jaguarundi.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative will avoid jeopardy to the ocelot and jaguarundi: prohibit use within three miles of occupied habitat.

Incidental Take - Despite the implementation of the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of ocelot and jaguarundi may occur as a result of sodium cyanide use within the range of these species.

Reasonable and Prudent Measure(s) - If implemented, the following reasonable and prudent measures will minimize incidental take: prior to use of sodium cyanide in potential ocelot or jaguarundi habitat, conduct survey to determine if habitat is occupied. If habitat is unoccupied, no further restrictions are applicable. If habitat is occupied, prohibit use within three miles.

Louisiana black bear - The bear could be exposed to sodium cyanide when the chemical is used in an M-44 device to control canid predators such as foxes and feral dogs. EPA requires a number of restrictions on the use of the device, which would minimize the opportunity of an endangered species coming in contact with the M-44 device. According to EPA, the M-44 shall not be used in areas where endangered species may be adversely affected. However, the bear requires a large home range, and at times will venture from that range in search of additional prey. Young bears will also disperse to establish new home range territory. The registered use of the canid control chemical permits up to 20 M-44 devices per square mile. Consequently, there is opportunity for bears to be exposed to an M-44 device. Although these sodium cyanide devices are designed for canid control, there are documented kills of other mammals including skunks, bobcats and mountain lions. Because of the bear's relatively small population, any poisoning event could threaten the survival of the species. Therefore, it is the Service's opinion that the use of sodium cyanide is likely to jeopardize the continued existence of the Louisiana black bear.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Louisiana black bear: prohibit the use of the chemical device within the known occupied habitat of the Louisiana black bear.

Incidental Take - Because individuals of the species may disperse beyond a given home range, the use and toxicity of the pesticide is still a concern. Consequently, the Service anticipates that an unquantifiable level of incidental take may occur as a result of the use of the pesticide outside of the prohibited use zone.

Reasonable and Prudent Measure(s) - The following reasonable and prudent measure for minimizing incidental take should be adopted and implemented: prohibit the use of sodium cyanide (M-44s) in the geographic range of the Louisiana black bear until after the user has contacted the local Fish and Wildlife Service office and that office has determined that there are no known Louisiana black bears in the general vicinity of where the M-44's are going to be used.

San Joaquin kit fox - The primary risk of exposure of San Joaquin kit foxes to sodium cyanide would occur during use of this chemical in M-44 devices to control coyotes and other canids. M-44 devices (consisting of a stake with an attractant and spring loaded capsule containing the active ingredient) are targeted specifically for the control of wide-ranging canid species. They are highly attractive to such species, are highly dangerous when triggered, and are relatively non-selective. Because of these qualities, use of M-44 devices within the San Joaquin kit fox range would pose a significant exposure hazard to kit foxes and could have significant adverse impacts on the species. If permitted, use of M-44 devices likely would occur throughout the kit fox range because four potential target species (coyotes, red foxes, grey foxes, and feral dogs,) share this area. For these reasons, it is the Service's biological opinion that use of sodium cyanide in M-44 devices within the San Joaquin kit fox range is likely to jeopardize the continued existence of this species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the San Joaquin kit fox: prohibit use of sodium cyanide M-44 devices within the range of the San Joaquin kit fox.

Incidental Take - With implementation of the reasonable and prudent alternatives described above, no incidental take is anticipated and therefore none is authorized.

California Condor - The primary exposure of sodium cyanide from registered uses can occur when a California condor activates the M-44 device by its foraging activities. Limited reintroduction of California condors by the Service has begun in 1991. Therefore, it is the Service's biological opinion that use of sodium cyanide is likely to jeopardize the continued existence of this species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the California condor: the use of sodium cyanide should be prohibited in condor occupied habitat including Ventura, Kern, Santa Barbara, Los Angeles, and San Luis Obispo Counties. Alternative control of canid predators must be considered to avoid the inadvertent poisoning of California condors.

Incidental Take - With implementation of the reasonable and prudent alternative described above, no incidental take is anticipated and therefore none is authorized.

RATIONALE FOR NO JEOPARDY DETERMINATIONS

Gray wolf and Grizzly bear - The registration of sodium cyanide capsules for use in the M-44 device for control of canid predators could result in the mortality of a gray wolf or grizzly bear. However, EPA also requires a number of restrictions, some of which should provide protection to the gray wolf and grizzly bear. According to EPA, the M-44 shall not be used in areas where threatened or endangered species may be adversely affected. Based on that restriction, it is the Service's opinion that the registered use of sodium cyanide is not likely to jeopardize the continued existence of the gray wolf or the grizzly bear.

Incidental Take - While applicators are restricted from using the M-44 in areas where a gray wolf or grizzly bear may be adversely affected, these two species have a very wide range and thus could be inadvertently taken in areas not mapped and/or prior to the

applicator's knowledge that the species may be in the control area. The Service, therefore, anticipates that an unquantifiable level of incidental take may occur as a result of the use of sodium cyanide.

Reasonable and Prudent Measure(s) - The following reasonable and prudent measures should be adopted: prohibit the application of sodium cyanide (M-44s) in the geographic range of the gray wolf and grizzly bear until after the user has contacted the local Fish and Wildlife Service office and that office has determined that there are no known wolves or grizzly bears in the general vicinity of where the M44's are going to be applied.

Alala (Hawaiian crow) and Mariana crow- Both of these corvids are, in part, carrion feeders. M-44 sodium cyanide devices may pose a potential threat due to the possibility that the crows may be attracted to baits associated with capsule deployment. There are few incidents of feral dog predation on livestock in these geographic areas and canid control is typically effected through shooting or trapping. M-44 devices are not expected to be employed in Hawaii or Guam. The alala is currently restricted to the coastal slope of Mona Loa on the island of Hawaii and only 12 birds were estimated to occur in the wild in 1990. The Mariana Crow is currently restricted to forest areas from Ritidian Point to Anao along the northern cliffline, in Northwest Field, and in the Convention Weapons Storage Areas of Guam and on the island of Rota. Consequently, it is the Service's biological opinion that use of sodium cyanide as described above within or adjacent to habitat occupied by the alala and Mariana crow is not likely to jeopardize the continued existence of these species.

Incidental take- The Service anticipates that an unquantifiable level of incidental take of the alala and Mariana common crow may occur as a result of sodium cyanide use within the occupied habitat of these species.

Reasonable and Prudent Measure(s)- The following reasonable and measure for minimizing incidental take must be adopted: prohibit the use of sodium cyanide within occupied habitat on Guam, Rota and the island of Hawaii.

Sodium fluoroacetate (1080)

CHEMICAL INFORMATION

TYPE: Predator control - coyotes

FORMULATION: Livestock protection collar, 30 ml (300 mg Compound 1080 = 1% AI) or 60 ml (600 mg Compound 1080 = 1% AI) rubber bladder toxicant reservoir, for use on sheep and goats only.

REGISTERED USES: Livestock depredation collar for sheep and goats to control depredating coyotes. Registered for use only by the states of South Dakota, Montana, Wyoming, New Mexico, and Texas. All other uses of sodium fluoroacetate have been canceled.

BACKGROUND:

Mode of action: Inhibitor of citric acid cycle leading to general inhibition of oxidative energy metabolism at the cellular level with the central nervous system and heart most critically affected (Peters 1952). Three molecules of fluoroacetate combine in the liver to form a molecule of fluocitrate, which poisons enzymes critical to cellular respiration. The heart and the brain are most affected.

Aquatic toxicity: Because use of sodium fluoroacetate is limited to toxic collars on livestock in fenced pastures, and restricted to use by trained applicators, the potential for exposure of Compound 1080 in amounts that would cause harm in aquatic environments is virtually nonexistent. However, if a lake or large river is used as a containment barrier, exposure of aquatic species must be considered in event of a collar puncture in or immediately adjacent to water.

Terrestrial toxicity: Sodium fluoroacetate is very highly toxic to birds and mammals. The median LD_{50} for 13 species of birds representing five taxonomic orders is 5.5 mg Compound 1080/kg body mass, with carrion feeding black-billed magpie (1.6 mg/kg) and turkey vulture (20 mg/kg) representing the extremes (Atzert 1971, Hudson et al. 1984). Japanese quail and turkey vulture are the only birds to give LD_{50} s above 10 mg/kg. The golden eagle LD_{50} is 3.5 mg/kg. In tests of 11 carnivorous and four herbivorous mammals, the median LD_{50} is 0.5 mg Compound 1080/kg body mass, with the domestic dog (0.07 mg/kg) and opossum (60 mg/kg) providing the extremes (Atzert 1971, Hudson et al. 1984). Domestic sheep and cows and mule deer all have LD_{50} s < 1 mg/kg. In a test of Compound 1080's secondary hazard, European ferrets were fed mice that had been dosed with the equivalent of 1, 2, 4, or 8 mg/kg of ferret body weight. The ferrets were given one mouse at 1-2 h after dosing and all the ferrets died (Hudson et al. 1984). Other studies also suggest the potential for poisoning from secondary exposure to Compound 1080 (e.g., Rudd and Genelly 1956, Eastland and Beasom 1986, Hegdal et al. 1986). Another variable affecting toxicity is ambient temperature. Turkey vultures are about 2.5 times as sensitive to acute Compound 1080 exposure at 8-9°C than when dosed at 23-28°C (Fry et al. 1986).

The EPA concludes that direct ingestion of Compound 1080 likely would kill most predators, and ingestion of dead sheep, goats, or coyotes with Compound 1080 in or on their flesh, conceivably

could kill the predators as well. Thus, concerning this pesticidal use, the possibility of direct exposure is the primary issue in making a "may affect" determination. There is a direct exposure risk to grizzly bears and gray wolves depredating on Compound 1080 collared livestock. There is less risk to listed species that scavenge because of their feeding habitats and the fact that the use of the toxic collar is restricted to trained applicators. However, when a water barrier is used to contain collared animals, carrion-feeding and predatory mammals and birds associated with water will be at risk to exposure. There is a slight risk of poisoning associated with exposure to carcasses of animals killed with Compound 1080. Consistent with its restricted use pattern, no direct or indirect effects are expected with Compound 1080 with respect to listed plants or plant pollinators.

Wildlife incidents: The livestock protection collar may only be used on a restricted number of sheep and goats in accordance with specified acreage within approved enclosures that may include natural barriers such as escarpments, lakes, and large rivers (Connolly 1989). All collared livestock must be accounted for weekly. Once a toxicant reservoir is punctured or the collar otherwise damaged, the collar and all Compound 1080 wastes must be retrieved and properly disposed (toxic solution contains yellow dye as a safety marker). Prompt disposal of collared livestock carcasses and predators suspected of Compound 1080 poisoning is essential because residual toxicant on livestock and poisoning by secondary exposure from scavenging dead predators has been reported (Rudd and Genelly 1956, Eastland and Beasom 1986, Connolly 1989). Because of the highly controlled use of the livestock protection collar and the manageable circumstances of its use, significant environmental pressure of sodium fluoroacetate is highly unlikely from its single registered use provided barriers prevent contamination of natural waters.

BIOLOGICAL OPINION

CHEMICAL REFERENCE TABLE

(The following table contains only those species for which the Service provided a jeopardy or no jeopardy call. Species not included in this list are either not affected by the chemical or have no chance for exposure. For a complete list of all species considered in this opinion, refer to the master species list on page III-1 of the species profile section.)

Species Name	J/NJ	PAGE
MAMMALS		
Gray wolf	J	88
Grizzly bear	J	89

RATIONALE FOR JEOPARDY DETERMINATIONS

Gray wolf - The only registered use for compound 1080 is in toxic livestock collars for sheep and goats that are used to control depredating coyotes. It is a restricted use pesticide registered for use only by the Animal and Plant Health Inspection Service (APHIS) and the States of SD, MT, WY, NM, and TX. While wolves usually do not make throat attacks, there is still a possibility that they may bite into a collar while killing or feeding on a collared animal. As little as 0.1 ml of collar contents could be fatal to a 25-pound dog, and the amount of compound 1080 (30 ml or 60 ml) used to kill coyotes could have a lethal or sublethal effect on the wolf. It is, therefore, the Service's opinion that the registered use of sodium fluoroacetate (compound 1080) is likely to jeopardize the continued existence of the gray wolf.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the gray wolf: prior to the proposed use of the 1080 livestock protection collar in the following areas, the user should contact the nearest office of the Service to determine whether use of the collar may adversely affect the wolf. If it is determined by the Service or the user that the use of the collar may adversely impact a wolf, the collar should not be used in these following areas.

Idaho: Northern Boise, Bonner, Boundary, Clearwater, northwest Custer, Idaho, Lemhi, Shoshone, and Valley Counties.
 Montana: Beaverhead, Carbon, Flathead, Gallatin, Glacier, Lake, Lewis and Clark, Lincoln, Madison, Missoula, Park, Pondera, Powell, Sanders, Stillwater, Sweetgrass, and Teton Counties.
 Washington: Pend Oreille County.
 Wyoming: Fremont, Hot Springs, Park, Sublette, and Teton Counties, and Yellowstone National Park.

Incidental Take - With the implementation of the reasonable and prudent alternatives to preclude jeopardy to the gray wolf, no incidental take is anticipated and thus none is authorized.

Grizzly bear - As stated for the gray wolf, the only registered use for compound 1080 is in toxic livestock collars for sheep and goats that are used to control depredating coyotes. It is registered for use only by APHIS and several States including Wyoming and Montana. Being opportunistic feeders, grizzly bears could feed upon live sheep or lambs and on carrion of dead collared sheep as well as coyotes that have been killed as a result of the 1080 livestock protection collar. Although compound 1080 is highly toxic to some warm-blooded animals, there is no information on the toxicity of compound 1080 to grizzly bears. There is a reported LD50 for other bears of 0.5 to 1.0 mg/kg. It would, therefore, appear that a large collar (60 ml) or a small collar (30 ml) could be toxic to even a large grizzly bear. It is the Service's opinion that the registered use of sodium fluoroacetate (compound 1080) is likely to jeopardize the continued existence of the grizzly bear.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the grizzly bear: prior to the proposed use of the 1080 livestock protection collar in the following areas, the user should contact the nearest office of the Service to determine whether use of the collar may adversely impact the grizzly bear. If it is determined by the Service or the user that the use of the collar may adversely impact a grizzly bear, the collar should not be used in these specific areas.

Idaho: Bonner, Boundary, and Fremont Counties.
 Montana: Beaverhead, Carbon, Flathead, Gallatin, Glacier, Lake, Lewis and Clark, Lincoln, Madison, Missoula, Park, Sanders, Stillwater, Sweetgrass, and Teton Counties.
 Washington: East Pend Oreille, west Okanogan, Sakagit, and Whitcom Counties.
 Wyoming: Fremont, Park, and Teton Counties, and Yellowstone National Park.

Incidental Take - With the implementation of the reasonable and prudent alternatives to preclude jeopardy to the grizzly bear, no incidental take is anticipated and thus none is authorized.

Vitamin D3

CHEMICAL INFORMATION

TYPE: Rodenticide

FORMULATION: Ready-to-use bait, with station application rates ranging from 0.25-8 ounces of 0.075% AI bait concentration.

REGISTERED USES: Control of Norway rats, roof rats and house mice in and around homes, industrial, commercial, agricultural and poultry buildings and similar man-made structures.

BACKGROUND:

Mode of action: This product is the activated form of vitamin D and its toxic effects is a combination of actions on liver, kidney and possibly the myocardium. Death results from renal injury brought on by hypercalcemia.

Aquatic toxicity: EPA has not required aquatic toxicity data to support the registration of vitamin D3, and EPA provided no other aquatic toxicity with the consultation request. EPA (1991) reported that, due to the virtual insolubility of vitamin D3 (solubility < 1 ppm) and the bait application patterns, the pesticide will not be subject to run-off into aquatic systems. Therefore, EPA does not expect vitamin D3 to pose any problems for listed aquatic species.

Terrestrial toxicity: Vitamin D3 is classified as highly toxic to mammals with the lowest acute oral LD₅₀ value reported by EPA of 42.0 mg/kg for the rat. Avian toxicity testing with 30% AI material yielded in the following values: mallard LD₅₀ > 2,000 mg/kg, mallard LC₅₀ = 4,000 ppm, and northern bobwhite LC₅₀ = 2,000 ppm. Although EPA provided no data concerning potential secondary exposure, EPA does not expect vitamin D3 to pose any secondary hazard to listed species because (1) "Bell Laboratories indicated there was none when fed to beagles [personal communication with George Matschke, APHIS, Denver Wildlife Research Center]", (2) "opportunities for predatory or scavenging listed species to be exposed to mice or rats killed with vitamin D3 would be few", and (3) "using the worst case scenario of poisoned mice being consumed by a San Joaquin kit fox [see Bromadiolone], the hazard ratio would be >1." EPA does not expect problems to avian species associated with direct or secondary exposure. EPA concluded that because vitamin D3 is used in bait boxes and in locations inaccessible to wildlife, there should be no direct hazard to listed species, except where (1) listed species habitat is adjacent to urban buildings where vitamin D3 might be used, and (2) any listed species might be inclined to feed on bait attractive to commensal rodents.

Wildlife incidents: EPA reported no fish or wildlife poisoning incidents associated with D3.

BIOLOGICAL OPINION

CHEMICAL REFERENCE TABLE

(The following table contains only those species for which the Service provided a jeopardy or no jeopardy call. Species not included in this list are either not affected by the chemical or have no chance for exposure. For a complete list of all species considered in this opinion, refer to the master species list on page III-1 of the species profile section.)

Species Name	J/NJ	PAGE
MAMMALS		
Alabama beach mouse	J	92
Anastasia Island beach mouse	J	93
Carolina northern flying squirrel	J	93
Choctawhatchee beach mouse	J	92
Florida salt marsh vole	J	94
Fresno kangaroo rat	J	94
Giant kangaroo rat	NJ	95
Morro Bay kangaroo rat	J	95
Perdido Key beach mouse	J	92
Point Arena mountain beaver	NJ	95
Salt marsh harvest mouse	J	94
Southeastern beach mouse	J	93
Stephen's kangaroo rat	NJ	96
Tipton kangaroo rat	NJ	95

RATIONALE FOR JEOPARDY DETERMINATIONS

Alabama beach mouse, Choctawhatchee beach mouse, and Perdido Key beach mouse - Exposure of these beach mice to vitamin D3 could occur through consumption of poisoned baits when used to control rodents within or in close proximity to their occupied habitats. All three subspecies are restricted to mature coastal barrier dune systems along the Gulf of Mexico and occur in areas that are being encroached upon by various types of human development. Therefore, there is a high possibility of vitamin D3 being used where these mice could come in contact with it. The Choctawhatchee beach mouse is presently known to occur only on Shell Island at St. Andrews Bay in Bay County, Florida, and on approximately 7.9 km of beach dune habitat (coastline up to 150 m inland) near Topsail Hill, from around Morrison Lake eastward to Stalworth Lake, Walton County, Florida. The Alabama beach mouse presently is surviving only on disjunct tracts of the sand dune system from Fort Morgan State Park to the Romar Beach area in Baldwin County, Alabama. The Perdido Key beach mouse occurs only on Perdido Key in Baldwin County, Alabama and Escambia County, Florida. The distance to which occupied habitat of these species extends inland from the beach varies depending upon the configuration of the sand dune system and the vegetation present. Both subspecies utilize portions of the frontal or primary dunes; interdunal areas; and dunes further inland (secondary or interior dunes). Because of the restricted distributions of these species and the likelihood of vitamin D3 being used for rodent control within or adjacent to areas which they inhabit, it is the Service's biological opinion that the registered use of vitamin D3 is likely to jeopardize the continued existence of the Choctawhatchee beach mouse, the Alabama beach mouse, and the Perdido Key beach mouse.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of vitamin D3 within 100 yards of occupied habitat of the Choctawhatchee beach mouse, the Alabama beach mouse, and the Perdido Key beach mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Anastasia Island beach mouse and Southeastern beach mouse - These two beach mice are endemic to the east coast of Florida. The Anastasia Island beach mouse is presently believed to occur only on Anastasia Island, St. Johns County, Florida. The southeastern beach mouse is believed to presently occur only from Florida's Mosquito (Ponce) Inlet in Volusia County south to Hutchinson Island in St. Lucie County, Florida. Both subspecies inhabit sand dunes vegetated by sea oats and dune panic grass and the scrub adjoining these dunes, which is vegetated with oaks, sand pine, palmetto, sea grapes, and/or wax myrtle. Since the ranges of both species have been and continue to be encroached upon by various types of human development, it is likely that vitamin D3 could be used for pest control in areas where both these beach mice occur. Exposure of the mice to vitamin D3 would occur through ingestion of poison baits, which would result in direct mortality of individuals of the species. Accordingly, it is the Service's biological opinion that the registered use of vitamin D3 is likely to jeopardize the continued existence of the Anastasia Island beach mouse or the southeastern beach mouse.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of vitamin D3 within 100 yards of occupied habitat of the Anastasia Island beach mouse and the southeastern beach mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Carolina northern flying squirrel - This species may be directly exposed to vitamin D3 poisoning from its registered use to control rats and mice around agricultural buildings and other man-made structures. The Carolina northern flying squirrel occurs in coniferous and northern hardwood forests, and may occasionally forage on the ground. Where land use changes and development encroach on the species' habitat there is a potential risk of the squirrel coming in contact with vitamin D3 bait that is placed outside of buildings (e.g., storage sheds and barns). Vitamin D3 bait is toxic to rodents and would most likely kill a northern flying squirrel if it consumed the bait. Due to the restricted range and small population of the Carolina northern flying squirrel, any poisoning of individuals could threaten the survival of the species. Therefore, it is the Service's opinion that the use of vitamin D3 is likely to jeopardize the continued existence of the Carolina northern flying squirrel.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Carolina northern flying squirrel: prohibit the outdoor use of the chemical within the species' occupied habitat.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Florida salt marsh vole - Exposure of the vole to vitamin D3 could occur through consumption of poisoned baits used to control rodents in close proximity to the vole's occupied marsh habitat. There is a possibility of the rodenticide being used around buildings or other structures adjacent to salt marsh habitat where the vole could come in contact with it. The vole is restricted to a single known area in the salt marsh of Waccasassa Bay, Levy County, Florida. This rodenticide is highly toxic to mammals. Because of the restricted distribution of the species, its limited population, and the likelihood of this rodenticide being used for rodent control adjacent to areas in which the vole occurs, it is the Service's biological opinion that the use of vitamin D3 is likely to jeopardize the continued existence of the Florida salt marsh vole.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of vitamin D3 within 100 yards of the landward edge of the species' salt marsh habitat in Levy County, Florida.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Fresno kangaroo rat, salt marsh harvest mouse - Despite relatively restricted vitamin D3 use patterns (registered for use as ready-to-use bait in and around human structures only), Fresno kangaroo rats, and salt marsh harvest mice are vulnerable to vitamin D3 exposure for the following reasons: (1) all occupy some habitats in which man-made structures exist nearby (residences and agricultural buildings in the San Joaquin Valley, commercial and industrial buildings in the vicinity of San Francisco Bay salt marshes, (2) all occupy highly restricted and/or fragmented habitats; and (3) all rodents are highly susceptible to the toxic effects of this compound. It is the Service's biological opinion that use of vitamin D-3 within the range of the Fresno kangaroo rat and salt marsh harvest mouse is likely to jeopardize the continued existence of these species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Fresno kangaroo rat, salt marsh harvest mouse: prohibit outdoor vitamin D-3 use within 100 yards of all habitats occupied by these species.

Incidental Take - Although possible exposure of the Fresno kangaroo rat and salt marsh harvest mouse to Vitamin D-3 probably is minimal, the Service anticipates that an unquantifiable level of incidental take may occur as a result of Vitamin D-3 use within the ranges of these species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Morro Bay kangaroo rat - The primary exposure of vitamin D3 from registered uses can occur when the Morro Bay kangaroo rat ingests treated bait. The extremely limited range of this species, the presence of target rodents, and the interspersed habitat of this species with urban, agricultural, and commercial buildings place the Morro Bay kangaroo rat at risk. It is the biological opinion of the Service that use of vitamin D3 is likely to jeopardize the continued existence of the Morro Bay kangaroo rat.

Reasonable and Prudent Alternative - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Morro Bay kangaroo rat: prohibit the use of vitamin D3 within 100 yards of the occupied habitat of the Morro Bay kangaroo rat.

Incidental Take - With implementation of the reasonable and prudent alternative described above, no incidental take is anticipated and therefore none is authorized.

RATIONALE FOR NO JEOPARDY DETERMINATIONS

Giant kangaroo rat, Tipton kangaroo rat - Despite relatively restricted vitamin D3 use patterns (registered for use as ready-to-use baits in and around human structures only), giant kangaroo rats and Tipton kangaroo rats may be subject to periodic vitamin D3 exposure because they sometimes occupy habitats that are adjacent to human activities and structures. Tipton kangaroo rats may be found near residential, agricultural, and commercial buildings in the southern San Joaquin Valley; while giant kangaroo rats may be found in oil fields and rangelands in the southwest and west central portions of the Valley where industrial and ranch structures are present. However, both species have a more widespread range than the Fresno kangaroo rat discussed above, and large portions of their ranges are far removed from anticipated vitamin D3 uses. Therefore, the Service concludes that vitamin D3 use within the range of the giant kangaroo rat and Tipton kangaroo rat is not likely to jeopardize the continued existence of these species.

Incidental Take - Although possible exposure of the giant kangaroo rat and Tipton kangaroo rat to vitamin D-3 probably is minimal, the Service anticipates that an unquantifiable level of incidental take may occur as a result of vitamin D-3 use within the range of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the giant and Tipton kangaroo rat will be minimized: prohibit outdoor vitamin D-3 use within areas accessible to wildlife that are within 100 yards of all habitats known or likely to be occupied by these species. Habitats likely to be occupied include native lands, grasslands, agricultural lands fallow for two years or more, and canal and levee embankments.

Point Arena Mountain Beaver - Despite relatively restricted vitamin D3 use patterns (registered for use as ready-to-use bait in tamper-resistant bait boxes in and around human structures only), the Point Arena Mountain beaver is vulnerable to vitamin D3 exposure for the following reasons: (1) it occupies some habitats in which man-made structures exist nearby (residences, agricultural buildings, municipal, and communication structures in the Point Arena vicinity); (2) it occupies highly restricted and/or fragmented habitats; and (3) rodents are highly susceptible to the toxic effects of this compound. It is the Service's biological opinion that use of vitamin D-3 within the

range of the Point Arena mountain beaver is not likely to jeopardize the continued existence of this species.

Incidental Take - Although possible exposure of the Point Arena mountain beaver to vitamin D-3 probably is minimal, the Service anticipates that an unquantifiable level of incidental take may occur as a result of vitamin D-3 use within the range of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the Point Arena mountain beaver will be minimized: prohibit outdoor vitamin D-3 use within 100 yards of all habitats occupied by this species.

Stephen's kangaroo rat -primary exposure of vitamin D3 from registered uses can occur when Stephen's kangaroo rat ingests treated bait. It is the biological opinion of the Service that use of vitamin D3 is not likely to jeopardize the continued existence of the Stephen's kangaroo rat.

• Incidental Take - The service anticipates that an unquantifiable level of incidental take may occur as a result of vitamin D3 use within the occupied habitat of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the Stephen's kangaroo rat will be minimized: prohibit the use of vitamin D3 within 100 yards of all habitats occupied by this species.

Warfarin

CHEMICAL INFORMATION

TYPE: Rodenticide (coumarin anticoagulant)

FORMULATION: Water soluble, ready-to-use baits, concentrates (in corn starch for mixing with cornmeal, rolled oats, or other materials), powder, liquid concentrates, nylon pouches, coated talc, and dust (Sine 1992).

REGISTERED USES: Control of Norway rats, roof rats, and house mice control primarily in and around homes and other buildings. Warfarin's uses also include agricultural, commercial, institutional, and industrial sites as well as transportation vehicles such as aircraft, ships, and rail cars. Warfarin baits must be placed in tamperproof boxes (d-CON 1974, Haco Inc. 1992a and 1992b). Approximately 8000 pounds active ingredient of warfarin are used annually.

BACKGROUND:

Mode of action: Warfarin (including its sodium salt) is a general use anticoagulant rodenticide that acts by depressing the clotting capabilities of the blood while concurrently increasing the permeability of capillaries throughout the body. This action predisposes the exposed animal to widespread internal hemorrhage. There is a 12-72 hour delay between ingestion of a single toxic dose and the appearance of the first toxic effects. It takes several days and repeated feedings on warfarin to kill a rodent.

Aquatic Toxicity: Warfarin is essentially insoluble in water (solubility 195 ppm), except for its water soluble sodium salt formed in alkaline solutions. Laboratory LC_{50} values for rainbow trout and bluegill, are >16 and >17.5 ppm, respectively, and the *Daphnia magna* EC_{50} is 17 ppm. It is unlikely that normal use of warfarin would harm aquatic fauna, as its application methods (mainly tamper-proof bait packets in and around buildings) and its characteristic of being essentially insoluble in water should preclude exposure. Therefore, warfarin should not be subject to runoff, leaching, or drift.

Terrestrial toxicity: Laboratory LD_{50} s of warfarin for rats, mallards, and northern bobwhite are 3.0, 621, and >2000 mg/kg, respectively. Data indicate that warfarin is non-toxic to bees (Sine 1992). Direct exposure of listed species to warfarin is unlikely because the pesticide should be inaccessible to wildlife when used according to label directions. However, there is concern for exposure where human development has encroached on the habitat of listed rodents. Thus, there is a "may affect" situation if (1) habitat of a listed species is adjacent to buildings where warfarin might be used and, (2) any listed species might be inclined to feed on bait attractive to commensal rodents. The potential for significant secondary exposure to warfarin is low because the levels of warfarin in the target animals are likely to be quite low to a predator or scavenger under all but the most extreme circumstances.

Wildlife incidents: EPA reported no wildlife poisoning incidents associated with warfarin.

BIOLOGICAL OPINION

CHEMICAL REFERENCE TABLE

(The following table contains only those species for which the Service provided a jeopardy or no jeopardy call. Species not included in this list are either not affected by the chemical or have no chance for exposure. For a complete list of all species considered in this opinion, refer to the master species list on page III-1 of the species profile section.)

Species Name	J/NJ	PAGE
MAMMALS		
Alabama beach mouse	J	98
Anastasia Island beach mouse	J	99
Carolina northern flying squirrel	J	99
Choctawhatchee beach mouse	J	98
Florida salt marsh vole	J	100
Fresno kangaroo rat	J	100
Giant kangaroo rat	NJ	101
Morro Bay kangaroo rat	J	101
Perdido Key beach mouse	J	98
Point Arena mountain beaver	NJ	101
Salt marsh harvest mouse	J	100
Southeastern beach mouse	J	99
Stephen's kangaroo rat	NJ	101
Tipton kangaroo rat	NJ	101

RATIONALE FOR JEOPARDY DETERMINATIONS

Alabama beach mouse, Choctawhatchee beach mouse, and Perdido Key beach mouse - Exposure of these beach mice to warfarin could occur through consumption of poisoned baits when used to control rodents within or in close proximity to their occupied habitats. All three subspecies are restricted to mature coastal barrier dune systems along the Gulf of Mexico and occur in areas that are being encroached upon by various types of human development. Therefore, there is a high possibility of warfarin being used where these mice could come in contact with it. The Choctawhatchee beach mouse is presently known to occur only on Shell Island at St. Andrews Bay in Bay County, Florida, and on approximately 7.9 km of beach dune habitat (coastline up to 150 m inland) near Topsail Hill, from around Morrison Lake eastward to Stalworth Lake, Walton County, Florida. The Alabama beach mouse presently is surviving only on disjunct tracts of the sand dune system from Fort Morgan State Park to the Romar Beach area in Baldwin County, Alabama. The Perdido Key beach mouse occurs only on Perdido Key in Baldwin County, Alabama and Escambia County, Florida. The distance to which occupied habitat of these species extends inland from the beach varies depending upon the configuration of the sand dune system and the vegetation present. Both subspecies utilize portions of the frontal or primary dunes; interdunal areas; and dunes further inland (secondary or interior dunes). Because of the restricted distributions of these beach mice and the likelihood of warfarin being used for rodent control within or adjacent to areas which they inhabit, it is the Service's biological opinion that the registered use of warfarin is likely to jeopardize the continued existence of the Choctawhatchee beach mouse, the Alabama beach mouse, and the Perdido Key beach mouse.

Reasonable and Prudent Alternative(s) - If implemented the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of warfarin within 100 yards of occupied habitat of the Choctawhatchee beach mouse, the Alabama beach mouse, and the Perdido Key beach mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Anastasia Island beach mouse and Southeastern beach mouse - These two beach mice are endemic to the east coast of Florida. The Anastasia Island beach mouse is presently believed to occur only on Anastasia Island, St. Johns County, Florida. The southeastern beach mouse is believed to presently occur only from Florida's Mosquito (Pounce) Inlet in Volusia County south to Hutchinson Island in St. Lucie County, Florida. Both subspecies inhabit sand dunes vegetated by sea oats and dune panic grass and the scrub adjoining these dunes, which is vegetated with oaks, sand pine, palmetto, sea grapes, and/or wax myrtle. Since the ranges of both subspecies have been and continue to be encroached upon by various types of human development, it is likely that warfarin could be used for pest control in areas where both these beach mice occur. Exposure of the mice to warfarin would occur through ingestion of poison baits, which would result in direct mortality of individuals of the species. Accordingly, it is the Service's biological opinion that the registered use of warfarin is likely to jeopardize the continued existence of the Anastasia Island beach mouse or the southeastern beach mouse.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of warfarin within 100 yards of occupied habitat of the Anastasia Island beach mouse and the southeastern beach mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Carolina northern flying squirrel - This species may be directly exposed to warfarin poisoning from its registered use to control rats and mice around and in the vicinity of buildings, including homes, commercial and agricultural sites. The Carolina northern flying squirrel occurs in coniferous and northern hardwood forests, and may occasionally forage on the ground. Where land use changes and development encroach on the species' habitat there is a potential risk of the squirrel coming in contact with warfarin bait that is placed outside of buildings (e.g., storage sheds and barns). Warfarin is toxic to rodents and would most likely kill a northern flying squirrel if it consumed the bait. Due to the restricted range and small population of the Carolina northern flying squirrel, any poisoning of individuals could threaten the survival of the species. Therefore, it is the Service's opinion that the use of warfarin is likely to jeopardize the continued existence of the Carolina northern flying squirrel.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Carolina northern flying squirrel: prohibit the outdoor use of the chemical within the species' occupied habitat.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Florida salt marsh vole - Exposure of the vole to warfarin could occur through consumption of poisoned baits used to control rodents in close proximity to the vole's occupied marsh habitat. There is a possibility of the rodenticide being used around buildings or other structures adjacent to salt marsh habitat where the vole could come in contact with it. The vole is restricted to a single known area in the salt marsh of Waccasassa Bay, Levy County, Florida. This rodenticide is highly toxic to mammals. Because of the restricted distribution of the species, its limited population, and the likelihood of this rodenticide being used for rodent control adjacent to areas in which the vole occurs, it is the Service's biological opinion that the use of warfarin is likely to jeopardize the continued existence of the Florida salt marsh vole.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: Prohibit use of warfarin within 100 yards of the landward edge of the species' salt marsh habitat in Levy County, Florida.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Fresno kangaroo rat, salt marsh harvest mouse - Despite relatively restricted warfarin use patterns (registered for use in bait boxes in and around human structures only), Fresno kangaroo rats and salt marsh harvest mice are vulnerable to warfarin exposure for the following reasons: (1) both occupy some habitats in which man-made structures exist nearby (residences and agricultural buildings in the San Joaquin Valley for the Fresno kangaroo rat, commercial and industrial buildings in the vicinity of San Francisco Bay salt marshes for the harvest mouse); (2) both occupy highly restricted and/or fragmented habitats; and (3) all rodent species are highly susceptible to the toxic effects of this compound. It is the Service's biological opinion that warfarin use within the range of the Fresno kangaroo rat and salt marsh harvest mouse is likely to jeopardize the continued existence of these species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Fresno kangaroo rat and salt marsh harvest mouse: prohibit outdoor warfarin use within 100 yards of all habitats occupied by these species.

Incidental Take - Although possible exposure of the Fresno kangaroo rat and salt marsh harvest mouse to warfarin probably is minimal, the Service anticipates that an unquantifiable level of incidental take may occur as a result of warfarin use within the ranges of these species.

Reasonable and Prudent Measure(s)- To minimize incidental take, EPA must establish a monitoring/enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Morro Bay kangaroo rat - The primary exposure of warfarin from registered uses can occur when the Morro Bay kangaroo rat ingests treated bait. The extremely limited range of this species, the presence of target rodents, and the interspersed habitat of this species with urban, agricultural, and commercial buildings place the Morro Bay kangaroo rat at risk. It is the biological opinion of the Service that use of warfarin is likely to jeopardize the continued existence of the Morro Bay kangaroo rat.

Reasonable and Prudent Alternative - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Morro Bay kangaroo rat: prohibit the use of warfarin within 100 yards of the occupied habitat of the Morro Bay kangaroo rat.

Incidental Take - With implementation of the reasonable and prudent alternative described above, no incidental take is anticipated and therefore none is authorized.

RATIONALE FOR NO JEOPARDY DETERMINATIONS

Giant kangaroo rat, Point Arena mountain beaver, Tipton kangaroo rat - Despite relatively restricted warfarin use patterns (registered for use in bait boxes in and around human structures only), giant kangaroo rats, Point Arena mountain beaver, and Tipton kangaroo rats may be subject to periodic warfarin exposure because they sometimes occupy habitats that are adjacent to human activities and structures. Tipton kangaroo rats may be found near residential, agricultural, and commercial buildings in the southern San Joaquin Valley of California; mountain beaver near municipal and communication structures in the Point Arena vicinity; and giant kangaroo rats in oil fields and rangelands in the southwest and west central portions of the San Joaquin Valley where industrial and ranch structures are present. However, both kangaroo species have a more widespread range than the Fresno kangaroo rat discussed above and large portions of their ranges are far removed from anticipated warfarin uses. Furthermore, restriction of this compound to use in bait boxes eliminates most avenues of exposure to mountain beaver. Therefore, the Service concludes that use of warfarin within the range of the giant kangaroo rat, Point Arena mountain beaver, and Tipton kangaroo rat is not likely to jeopardize the continued existence of these species.

Incidental Take - Although possible exposure of the giant kangaroo rat, Point Arena mountain beaver, and Tipton kangaroo rat to warfarin probably is minimal, the Service anticipates that an unquantifiable level of incidental take may occur as a result of warfarin use within the range of these species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the giant kangaroo rat, Point Arena mountain beaver, and Tipton kangaroo rat will be minimized: Prohibit outdoor warfarin use within 100 yards of habitats occupied by these species.

Stephen's kangaroo rat - The primary exposure of warfarin from registered uses can occur when Stephen's kangaroo rat ingests treated bait. It is the biological opinion of the Service that use of warfarin is not likely to jeopardize the continued existence of the Stephen's kangaroo rat.

Incidental Take - The service anticipates that an unquantifiable level of incidental take may occur as a result of warfarin use within the occupied habitat of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the Stephen's kangaroo rat will be minimized: prohibit the use of warfarin within 100 yards of its occupied habitat.

Zinc phosphide

CHEMICAL INFORMATION

TYPE: Rodenticide

FORMULATION: Bait in the form of granules, pellets, tablets, or treated oats, wheat, or corn meal. It is also formulated as wettable powder used to coat fruit, vegetables or dry pet food for use at specific bait stations. Also, a 10% tracking powder which is registered for indoor use only. Broadcast baiting and aerial application of granular bait is used. Aerial application cannot be used over unharvested crops, nor on bare ground.

REGISTERED USES: To control rodents in orchards, rangeland, forest, vineyards, sugarcane, macadamia nuts, agricultural crops, ornamentals, lawns, golf courses, recreational areas, rights-of-way, animal burrows, and in and around all types of buildings.

BACKGROUND:

Mode of action: Its effect comes from the liberation and absorption of phosphine gas when the ingested zinc phosphide comes in contact with the acidic condition in the gut. Pulmonary edema is a common cause of death.

Aquatic toxicity: Zinc phosphide's solubility is <1 ppm, and it is relatively insoluble in alcohol or cold water. The pesticide breaks down into zinc and phosphine gas when exposed to acidic conditions. The available aquatic bioassay data indicate that even in a worst case scenario using broadcast application, zinc phosphide would not affect aquatic organisms. Therefore, EPA finds that there will be no problems to aquatic organisms associated with direct or secondary exposure to zinc phosphide.

Terrestrial toxicity: Zinc phosphide breaks down in the acidic environment of the gut and releases highly volatile phosphine gas. Thus, there should not be a great opportunity for predators or scavengers to be secondarily exposed to the pesticide. However, several days are required for a complete breakdown in the gut, and there is a secondary poisoning hazard for this period (Rudd and Genelly 1956). In some instances it may be possible for a predator or scavenger to receive lethal exposure from ingesting or inhaling phosphine gas directly from the gut of prey that had ingested zinc phosphide bait. This has been demonstrated in laboratory tests. There are no readily available accounts of predators or scavengers being poisoned in the wild by secondary exposure to zinc phosphide. However laboratory tests indicate that there is potential hazard.

In a zinc phosphide study conducted by the Fish and Wildlife Service in Michigan, Hegdal and Gatz (1977) found that most microtine rodents and some rabbits and pheasants were killed. Other notable findings include (1) although bait left in the field for 5 months lost 80-90% of its toxicity, it still would kill a deer mouse, (2) hazards to seed-eating birds appear to be minimal, although 1 jay species died from apparent direct zinc phosphide poisoning, and (3) the potential for significant secondary exposure to predators and raptors from baiting for orchard mice is highly

unlikely. In a controlled experiment, treated grain exposed to rain and snow was still lethal to laboratory mice after 27 days of outdoor exposure (Hayne 1951).

Tietjen (1976) conducted laboratory and field studies required for development of zinc phosphide to control black-tailed prairie dogs (*Cynomys ludovicianus*). His conclusions including the following: (1) Residues of phosphine in vegetation from areas treated with up to 3 times a high and low application rate were nominal and of no environmental consequence at 1, 15 and 30 days posttreatment. (2) The likelihood of treatment with 4 g per prairie dog burrow causing either primary or secondary intoxication of non-target vertebrates, including black-footed ferrets (*Mustela nigripes*), is remote.

During 1964-1965, Denver Wildlife Research Center scientists conducted studies of secondary exposure using zinc phosphide-poisoned nutria (*Myocastor coypus*) (Evans et al. 1965). Poisoning occurred only when test species ingested zinc phosphide directly from the stomach contents or hair of an intoxicated nutria.

Zinc phosphide initially was considered a possible substitute for strychnine, primarily because of its lower secondary hazard potential and toxic residues are not stored in tissues of poisoned animals. Poisoning from secondary exposure is associated with consuming stomach contents rather than the tissues of poisoned animals (Evans et al. 1970). In addition, animals that can regurgitate are further protected if they consume stomach contents containing zinc phosphide. Although cats can vomit after eating rats poisoned with zinc phosphide, they do not always do so in time to save themselves (Chitty 1954). Poultry and wild birds are all apparently very susceptible to direct poisoning from consuming treated bait (Chitty 1954). The color of zinc phosphide-treated baits may offer some protection to seed-eating birds by stimulating a feeding aversion (Rudd and Genelly 1956, Siefgried 1968, Hines and Dimmick 1970). The high degree of toxicity and lack of specificity of zinc phosphide pose some hazard to all vertebrates which may encounter it (Hines and Dimmick 1970).

Wildlife incidents: EPA reported no fish or wildlife poisoning incidents associated with zinc phosphide. Hundreds of wild geese died from consuming zinc phosphide bait 3 months after it was applied to fields to control meadow mice (Keith and O'Neill 1964). Nearly 40% of the zinc phosphide remained on the bait after 3 months of field exposure even though 1.5 inches of rain fell during the period.

BIOLOGICAL OPINION

CHEMICAL REFERENCE TABLE

(The following table contains only those species for which the Service provided a jeopardy or no jeopardy call. Species not included in this list are either not affected by the chemical or have no chance for exposure. For a complete list of all species considered in this opinion, refer to the master species list on page III-1 of the species profile section.)

Species Name	J/NJ	PAGE
MAMMALS		
Alabama beach mouse	J	105
Anastasia Island beach mouse	J	106
Black-footed ferret	J	106
Carolina northern flying squirrel	J	108

Species Name	J/NJ	PAGE
Choctawhatchee beach mouse	J	105
Florida salt marsh vole	J	108
Fresno kangaroo rat	J	109
Giant kangaroo rat	J	109
Gray wolf	NJ	116
Grizzly bear	NJ	116
Key Largo cotton mouse	J	109
Key Largo woodrat	J	109
Louisiana black bear	J	110
Lower Keys rabbit	J	110
Morro Bay kangaroo rat	J	111
Perdido Key beach mouse	J	105
Point Arena mountain beaver	J	111
Salt marsh harvest mouse	J	111
San Joaquin kit fox	NJ	117
Silver rice rat	J	112
Southeastern beach mouse	J	106
Stephen's kangaroo rat	J	112
Tipton kangaroo rat	J	109
Utah prairie dog	NJ	117
BIRDS		
Alala (Hawaiian crow)	J	113
Attwater's prairie chicken	J	113
Hawaiian coot	J	113
Hawaiian duck	J	113
Mariana crow	J	114
Mississippi sandhill crane	J	114
Nene (Hawaiian goose)	J	115
Puerto Rican plain pigeon	J	115
San Clemente sage sparrow	NJ	118
Whooping crane	NJ	118
Yellow-shouldered blackbird	J	116

RATIONALE FOR JEOPARDY DETERMINATIONS

Alabama beach mouse, Choctawhatchee beach mouse, and Perdido Key beach mouse - Exposure of these beach mice to zinc phosphide could occur through ingestion of poisoned baits when used to control rodents within or in close proximity to their occupied habitats. All three subspecies occur in areas that are being encroached upon by various types of human development. Therefore, there is a high possibility of zinc phosphide being used where these mice could come in contact with it. All three are restricted to mature coastal barrier dune systems along the Gulf of Mexico. The Choctawhatchee beach mouse is presently known to occur only on Shell Island at St. Andrews Bay in Bay County, Florida, and on approximately 7.9 km of beach dune habitat (coastline up to 150 m inland) near Topsail Hill, from around Morrison Lake eastward to Stalworth Lake, Walton County, Florida. The Alabama beach mouse presently is surviving only on disjunct tracts of the sand dune system from Fort Morgan State Park to the Romar Beach area in Baldwin County, Alabama. The Perdido Key beach mouse occurs only on Perdido Key in Baldwin County, Alabama and Escambia County, Florida. The distance to which occupied habitat of these species extends inland from the beach varies depending upon the configuration of the

sand dune system and the vegetation present. Both subspecies utilize portions of the frontal or primary dunes; interdunal areas; and dunes further inland (secondary or interior dunes). Because of the restricted distributions of these species and the likelihood of zinc phosphide being used for rodent control within or adjacent to areas which they inhabit, it is the Service's biological opinion that the registered use of zinc phosphide is likely to jeopardize the continued existence of the Choctawhatchee beach mouse, the Alabama beach mouse, and the Perdido Key beach mouse.

Reasonable and Prudent Alternative(s) - If implemented the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of zinc phosphide within 100 yards of occupied habitat of the Choctawhatchee beach mouse, the Alabama beach mouse, and the Perdido Key beach mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Anastasia Island beach mouse and Southeastern beach mouse - These two beach mice are endemic to the east coast of Florida. The Anastasia Island beach mouse is presently believed to occur only on Anastasia Island, St. Johns County, Florida. The southeastern beach mouse is believed to presently occur only from Florida's Mosquito (Pounce) Inlet in Volusia County south to Hutchinson Island in St. Lucie County, Florida. Both subspecies inhabit sand dunes vegetated by sea oats and dune panic grass and the scrub adjoining these dunes, which is vegetated with oaks, sand pine, palmetto, sea grapes, and/or wax myrtle. Since the ranges of both species have been and continue to be encroached upon by various types of human development, it is likely that zinc phosphide could be used for pest control in areas where both these beach mice occur. Exposure of the mice to zinc phosphide would occur through ingestion of poison baits, which would result in direct mortality of individuals of the species. Accordingly, it is the Service's biological opinion that the registered use of zinc phosphide is likely to jeopardize the continued existence of the Anastasia Island beach mouse or the southeastern beach mouse.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of zinc phosphide within 100 yards of occupied habitat of the Anastasia Island beach mouse and the southeastern beach mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Black-footed ferret - Zinc phosphide is a restricted use rodenticide registered for use on a wide variety of sites including orchards, rangeland, forest, agricultural crops, ornamentals, lawns, golf courses, recreational areas, rights-of-way, animal burrows, and in and around all types of buildings. It is used to control mice, rats, kangaroo rats, wood rats, ground squirrels, moles, pocket gophers, prairie dogs, and muskrats. EPA has determined that because zinc phosphide breaks down in the acidic environment of the gut and releases highly volatile phosphine gas, there should be little opportunity for predators or scavengers to be secondarily exposed to the pesticide. The likelihood of ferrets being found in the wild, while considered low, is still possible. The further loss or fragmentation of prairie dog habitat which has already been reduced by as much as 98

percent (from over 100 million acres to about 2 million acres) could cause the extinction of the species. Therefore, it is the Service's opinion that the use of zinc phosphide is likely to jeopardize the continued existence of the black-footed ferret.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the black-footed ferret:

1. A black-tailed prairie dog colony or complex of less than 80 acres having no neighboring prairie dog towns may be treated without a ferret survey. A midrange of 102 acres (61 to 294 acres) of occupied black-tailed prairie dog habitat is believed necessary to support a single isolated colony of less than 80 acres. A neighboring prairie dog town is defined as a colony less than 7 kilometers (4.34 miles) from the town to be treated, based on the longest distance that the ferret has been observed to travel during the night.
2. A white-tailed prairie dog colony or complex of less than 200 acres having no neighboring prairie dog towns may be treated without a survey. It is estimated to require between 196 and 475 acres of white-tailed prairie dogs to support a single ferret.
3. Urban situations (e.g., playgrounds, golf courses, etc.) and cultivated lands adjacent to prairie dog colonies may be treated without conducting surveys. The appropriate Service office will be contacted by the pesticide user in advance of any treatment to determine whether a proposed action fits this situation.
4. For black-tailed prairie dog colonies or complexes over 80 acres but less than 1,000 acres, and white-tailed prairie dog colonies or complexes over 200 acres but less than 1,000 acres, prairie dog control may be allowed after completing a black-footed ferret survey within 30 days of proposed treatments on colonies proposed for treatment, provided no ferrets or their sign are found. Prior to treatment, if all colonies in this complex are surveyed with no sign of ferrets, no future survey for ferrets would be recommended. These surveys will be coordinated with the appropriate State Office of the Fish and wildlife Service.
5. For prairie dog complexes over 1,000 acres, no control shall be allowed until the complex has been evaluated by appropriate State and/or Federal Agencies (those agencies working on State working groups for ferret recovery) for its potential as a recovery site and until the complex has been block cleared. One thousand acres would be a minimum complex size for consideration as a black-footed ferret reintroduction site and would likely require intensive management of habitat for a ferret population.
6. The EPA shall maintain records which shall be provided to the Service on an annual basis. These records can include the amount of acres of prairie dog towns or complexes controlled (e.g., Federal lands, private lands on a volunteer basis), or the amount of the chemical sold including application rates. This latter could be obtained from either the manufacturer or the vender.

Surveys shall be supervised by biologists trained in ferret survey techniques and ferret biology at a Service-approved training workshop. Currently, only the University of Wyoming has such a course. Ferret surveys shall be reviewed by the Service for compliance with survey standards and Section 7 of the Endangered Species Act.

Incidental Take - With the implementation of the reasonable and prudent alternatives to preclude jeopardy of the black-footed ferret, no incidental take is anticipated and thus none is authorized.

Carolina northern flying squirrel - This species posed to zinc phosphide poisoning from its registered use to control rodents including mice, rats and ground squirrels in and around agricultural buildings, forests, rights-of-way, and recreational areas. The Carolina northern flying squirrel occurs in coniferous and northern hardwood forests, and may occasionally forage on the ground. Where land use changes and development encroach on the species' habitat there is a potential risk of the squirrel coming in contact with zinc phosphide bait that is placed outside of buildings (e.g., storage sheds and barns) or in rights-of-way and forests. Zinc phosphide bait formulated as coated pet food, fruit and vegetables would likely be very attractive and palatable to the squirrel. Zinc phosphide when ingested is toxic to rodents and would most likely kill a northern flying squirrel if it consumed the bait. Due to the restricted range and small population of the Carolina northern flying squirrel, any poisoning of individuals could threaten the survival of the species. Therefore, it is the Service's opinion that the use of zinc phosphide is likely to jeopardize the continued existence of the Carolina northern flying squirrel.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Carolina northern flying squirrel: prohibit the outdoor use of the chemical within the species' occupied habitat.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Florida salt marsh vole - Exposure of the vole to zinc phosphide could occur through consumption of poisoned baits used to control rodents in close proximity to the vole's occupied marsh habitat. There is a possibility of the rodenticide being used around buildings or other structures and open areas adjacent to salt marsh habitat where the vole could come in contact with it. The vole is restricted to a single known area in the salt marsh of Waccasassa Bay, Levy County, Florida. This rodenticide is highly toxic to mammals. Because of the restricted distribution of the species, its limited population, and the likelihood of this rodenticide being used for rodent control adjacent to areas in which the vole occurs, it is the Service's biological opinion that the use of zinc phosphide is likely to jeopardize the continued existence of the Florida salt marsh vole.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of zinc phosphide within 100 yards of the landward edge of the species' salt marsh habitat in Levy County, Florida.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Fresno kangaroo rat, giant kangaroo rat, Tipton kangaroo rat - These kangaroo rats are highly vulnerable to zinc phosphide exposure because of the extremely wide variety of use patterns for which this chemical is registered. Areas within the ranges of these species (southern San Joaquin Valley, California) where zinc phosphide is likely to be used include the following: oil fields; rangelands; agricultural croplands; fallow agricultural lands; rights-of-way (e.g., aqueduct, canal, and levee embankments and roads); and buildings in and around oil fields, agricultural areas, and some municipalities (e.g., Tipton kangaroo rats in the Bakersfield vicinity). Most permitted zinc phosphide formulations would be highly attractive to kangaroo rats, including pellets and tablets, corn meal baits, pet food baits, and especially grain baits (oats and wheat). Furthermore, some permitted application methods would greatly increase the likelihood of kangaroo rats encountering such baits, including broadcast baiting and applications to burrows. In conclusion, because of (1) the numerous and potentially non-specific zinc phosphide exposure factors for these species; (2) the high toxicity of this compound to all rodents; and (3) the fact that each of these species occupies significantly restricted and/or fragmented habitats, the Service concludes that zinc phosphide use within the ranges of the Fresno kangaroo rat, giant kangaroo rat, and Tipton kangaroo rat is likely to jeopardize the continued existence of these species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Fresno, giant, and Tipton kangaroo rat: (1) Prohibit all outdoor uses of zinc phosphide grain baits within 100 yards of the occupied habitat of these species; (2) prohibit broadcast zinc phosphide applications outdoors and zinc phosphide applications to burrows within 100 yards of the occupied habitats of these species; and (3) prohibit outdoor use of zinc phosphide solid baits (granules, pellets, tablets, blocks) within 100 yards of the occupied habitats of these species, unless a specific kangaroo rat protection program for zinc phosphide use, approved by the Service in writing, is implemented.

Incidental Take - Despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of the Fresno, giant, and Tipton kangaroo rat may occur as a result of zinc phosphide use within the ranges of these species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Key Largo woodrat and Key Largo cotton mouse - Both the Key Largo woodrat and Key Largo cotton mouse occur in subtropical, evergreen, hardwood forests on the northern half of Key Largo, Monroe County, Florida, north of the point where U.S. Highway 1 enters Key Largo. Populations of both species may also occur in similar habitat on Lignumvitae Key, Monroe County, where the species were introduced in 1970. The Key Largo woodrat is primarily herbivorous, feeding mostly on buds, leaves, fruits, and seeds, but invertebrates occasionally are included in its diet. The diet of the Key Largo cotton mouse has not been documented, but it is believed to be very similar to that of the woodrat. The use of broadcast baits within or adjacent

to habitat of these two species is likely due to the close proximity of various types of human development to the areas where these species occur. Exposure of the woodrat and cotton mouse to zinc phosphide would result in direct mortality of individuals of the species. The most likely means of exposure of the woodrat and the cotton mouse to zinc phosphide would be ingestion of broadcast baits. Accordingly, it is the Service's biological opinion that the registered use of zinc phosphide is likely to jeopardize the continued existence of the Key Largo woodrat or Key Largo cotton mouse.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the species: prohibit use of the chemical within 100 yards of occupied habitat of the Key Largo woodrat and the Key Largo cotton mouse.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to these species, no incidental take is anticipated and therefore none is authorized.

Louisiana black bear - The black bear may be exposed to baits used in orchards, forests, sugarcane, vineyards, rights-of-way, other agricultural crops. Bears venture into such areas in search of food, and being opportunistic they will consume most any available food item. Because of the bear's small population and restricted range, mortality resulting from rodenticide poisoning could threaten the survival and recovery of the species. Therefore, it is the opinion of the Service that the use of zinc phosphide is likely to jeopardize the continued existence of the Louisiana black bear.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Louisiana black bear: use only tamper resistant bait boxes within the current known occupied habitat of the species.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to this species, no incidental take is anticipated and therefore none is authorized.

Lower Keys rabbit - The Lower Keys rabbit could be exposed to zinc phosphide when the rodenticide is used around buildings, rights-of-way, and other open areas that are adjacent to the rabbit's marsh habitat. The rabbit is likely to forage in some treated areas. Continued rapid development in the lower Keys greatly increases the potential that the rabbit would come in contact with rodenticide treated areas. Broadcast applications of flavored baits or poisoned food items would pose a serious threat to the species. This rodenticide would be lethal to Lower Keys rabbits if it were ingested. Because of the extremely restricted range of the species and its small population, any rodenticide induced poisonings could threaten the survival of the species. Therefore, it is the opinion of the Service that the use of zinc phosphide is likely to jeopardize the continued existence of the Lower Keys rabbit.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Lower Keys rabbit: Only tamper resistant bait boxes may be used outdoors within 100 yards of the species' occupied habitat.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Morro Bay kangaroo rat - The primary exposure of zinc phosphide from registered uses can occur when the Morro Bay kangaroo rat ingests granules, pellets, tablets, or other treated materials. The species is restricted to only a few locations in the vicinity of Morro Bay, California. It is the biological opinion of the Service that use of zinc phosphide is likely to jeopardize the continued existence of the Morro Bay kangaroo rat.

Reasonable and Prudent Alternative - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Morro Bay kangaroo rat: prohibit the use of zinc phosphide within 100 yards of the occupied habitat of the Morro Bay kangaroo rat.

Incidental Take - With implementation of the reasonable and prudent alternative described above, no incidental take is anticipated and therefore none is authorized.

Point Arena mountain beaver, salt marsh harvest mouse - These species may be subject to zinc phosphide exposure because some uses for which this chemical is registered (e.g., in and around buildings, lawns, recreational areas, golf courses, and rights-of-way) could occur within harvest mice or mountain beaver habitats or areas adjacent to such habitats. Both these species occupy areas in which man-made structures or sites exist nearby (commercial and industrial buildings in the vicinity of San Francisco Bay salt marshes, municipal and communication structures in the Point Arena vicinity, golf courses and similar sites in both areas). Furthermore, adverse effects of zinc phosphide use on the harvest mouse and mountain beaver could be significant because: (1) both species may be attracted to grain or pelletized zinc phosphide baits if applied in the vicinity of occupied habitats; (2) both are highly susceptible to the toxic effects of this compound; and (3) the habitats of these species are highly restricted and fragmented. It is the Service's biological opinion that zinc phosphide use within the ranges of the salt marsh harvest mouse and Point Arena mountain beaver is likely to jeopardize the continued existence of these species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the salt marsh harvest mouse: prohibit outdoor zinc phosphide use within 100 yards of occupied habitat of this species.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Point Arena mountain beaver: (1) Prohibit broadcast zinc phosphide applications outdoors and zinc phosphide applications to burrows within 100 yards of the occupied habitat of this species; and (2) prohibit outdoor zinc phosphide use (all baits) within 100 yards of the occupied habitat of this species, unless a specific mountain beaver protection program for zinc phosphide use, approved by the Service in writing, is implemented.

Incidental Take - Despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of the salt marsh harvest mouse and Point Arena mountain beaver may occur as a result of zinc phosphide use within the ranges of these species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Silver rice rat - The silver rice rat could be exposed to zinc phosphide when the rodenticide is used (for control of black and Norway rats, and house mice) around buildings, rights-of-way, ditches, and other areas that are adjacent to the rat's wetland habitat. The rat is likely to forage in some treated areas. Continued rapid development in the lower Keys greatly increases the potential that the rat would come in contact with rodenticide treated areas. Broadcast applications of flavored baits or poisoned food items would pose a serious threat to the species. This rodenticide would be lethal to silver rice rats if it were ingested. Because of the extremely restricted range of the species and its small population, any rodenticide induced poisonings could threaten the survival of the species. Therefore, it is the opinion of the Service that the use of zinc phosphide is likely to jeopardize the continued existence of the silver rice rat.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the silver rice rat: prohibit the outdoors use of the chemical within 100 yards of the current known occupied habitat of the species.

Incidental Take - With the implementation of the reasonable and prudent alternative to preclude jeopardy of the species, no incidental take is anticipated and therefore none is authorized.

Stephen's kangaroo rat - The primary exposure of zinc phosphide from registered uses can occur when Stephen's kangaroo rat ingests granules, pellets, tablets, or other treated materials. It is the biological opinion of the Service that use of zinc phosphide is likely to jeopardize the continued existence of the Stephen's kangaroo rat.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Stephen's kangaroo rat: (1) Prohibit all outdoor uses of zinc phosphide grain baits within 100 yards of the occupied habitat of this species; (2) prohibit broadcast zinc phosphide applications outdoors and zinc phosphide applications to burrows within 100 yards of occupied habitat of this species; and (3) prohibit outdoor use of zinc phosphide solid baits (granules, pellets, tablets, blocks) within 100 yards of the occupied habitat of this species, unless a specific kangaroo rat protection program for solid zinc phosphide baits, approved by the Service in writing, is implemented.

Incidental Take - Despite the reasonable and prudent alternatives described above, the Service anticipates that an unquantifiable level of incidental take of the Stephen's kangaroo rat may occur as a result of zinc phosphide use within the ranges of this species.

Reasonable and Prudent Measure(s) - To minimize anticipated incidental take, EPA must establish a monitoring enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Alala (Hawaiian crow) - The alala is found in a relatively well defined, restricted native forest area on the Island of Hawaii. Less than 20 individuals remain in the wild. There is an ongoing and approved mongoose trapping program in that area, and it is anticipated that certain rodenticide control measures for mongoose will be approved for the area in the near future. As both rats and mongooses are known to eat alala eggs, chicks, and fledglings, their control is recommended in the Hawaiian Crow Recovery Plan and consequently, other rodenticide agents may be considered. The alala are curious omnivores that may eat zinc phosphide-treated baits. Because of the above-mentioned threats, it is the Service's biological opinion that use of zinc phosphide on the island of Hawaii is likely to jeopardize the continued existence of the alala.

Reasonable and prudent Alternative(s)- If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the alala: prohibit the use of zinc phosphide within alala occupied habitat, unless it is contained in tamper resistant bait boxes.

Incidental Take- With the implementation of the Reasonable and Prudent Alternative to preclude jeopardy to the species, no incidental take is anticipated and, therefore, none is authorized.

Attwater's prairie chicken - The primary exposure of zinc phosphide to the prairie chicken is through its use on agricultural crops and rangeland. The bait is in the form of granules, pellets or treated grain and therefore would be available for direct ingestion by the prairie chicken. Zinc phosphide is acutely toxic to birds and could cause mortality if only a few treated grains or granules were consumed. Therefore, it is the Service's biological opinion that the use of zinc phosphide is likely to jeopardize the continued existence of Attwater's prairie chicken.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Attwater's prairie chicken: prohibit the use of zinc phosphide within 100 yards of occupied habitat. Tamper resistant bait boxes can be used within occupied habitat.

Incidental Take - With the implementation of the reasonable and prudent alternatives to preclude jeopardy of the species no incidental take is anticipated and therefore none is authorized.

Hawaiian coot and Hawaiian duck - Both of these Hawaiian waterbirds use ponds and other water features of golf courses and other grassy areas (such as turf farms) adjacent to wetlands. These ducks and coots will regularly come "ashore" to feed on invertebrates, grass shoots, seeds, and other dryland foods. Such feeding could expose them to zinc phosphide baits applied to grassy areas. The birds could be killed or sickened as a result of such rodenticide exposure.

The Hawaiian duck population in the State of Hawaii is estimated to be several thousand, with concentrations on the island of Kauai. Perhaps less than 100 still exist on the island of Oahu. About 1,000 Hawaiian coots remain on the islands of Kauai, Oahu, and Maui. Depletion of wetland habitat and predation by rats, mongooses, feral pigs, cats, and dogs are implicated in the endangered status of both species. Although depressed below "recovered" numbers, the populations of both of these species are relatively stable, and the dramatic increase in the number of golf courses and their water features may have, in small part, aided in their recovery.

However, if zinc phosphide baits are applied to these golf courses and turf farms, ducks and coots may ingest the rodenticide. Because of the above-mentioned threats, it is the Service's biological opinion that use of zinc phosphide in Hawaii is likely to jeopardize the continued existence of the Hawaiian duck and Hawaiian coot.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Hawaiian duck and Hawaiian coot: prohibit the use of zinc phosphide within 100 yards of any water or wetland on or adjacent to any golf course or turf farm on the islands of Kauai, Oahu, for the Hawaiian Duck, and the islands of Kauai, Oahu, and Maui for Hawaiian Coot, unless it is contained in tamper resistant bait boxes.

Incidental Take- With the implementation of the Reasonable and Prudent Alternative to preclude jeopardy to the species, no incidental take is anticipated and, therefore, none is authorized.

Mariana crow - Approximately 100 Mariana crows remain on Guam, confined to the forests at the far northern and, possibly, south-central portions of the island. Its endangered status is due to the brown tree snake, an introduced predator that feeds on crow eggs and chicks. Mariana crows are curious omnivores that might eat zinc phosphide-treated baits. Because of the above-mentioned threats, it is the Service's biological opinion that use of zinc phosphide in Guam is likely to jeopardize the continued existence of the Mariana crow.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Mariana crow: prohibit the use of zinc phosphide within Mariana crow occupied habitat, unless it is contained in tamper resistant bait boxes.

Incidental Take- With the implementation of the Reasonable and Prudent Alternative to preclude jeopardy to the species, no incidental take is anticipated and, therefore, none is authorized.

Mississippi sandhill crane - Zinc phosphide poses a threat to the Mississippi sandhill crane primarily when the rodenticide is used in agricultural fields, rangeland, orchards, and rights-of-way. This species presently exists in only very low numbers and is restricted to a relatively small area of Jackson County, Mississippi. The bird is non-migratory and has established fairly restricted nesting, foraging, and winter roosting areas. Nesting is generally limited to semi-open, wet, savanna areas within its range. It normally feeds in wet savannas, marshes, agricultural fields, and pastures. While the majority of this crane's range occurs on National Wildlife Refuge property, it is known to forage off refuge lands. The bird's diet includes earthworms, insects, small reptiles and amphibians, small birds, mice, roots and tubers, nuts, fruits, seeds, and grain from agricultural fields. According to the EPA's data, pheasants were killed by ingesting the poisoned baits during a field application study. This chemical can also be relatively persistent in the environment. Because of zinc phosphide's persistence in the environment and the high number its registered uses, the Service believes there is a high potential for the crane to be exposed to zinc phosphide through ingestion of baits while foraging in treated fields. Accordingly, in view of the Mississippi sandhill crane's restricted distribution, low population level, and its feeding habits, it is the

Service's biological opinion that the use of zinc phosphide is likely to jeopardize the continued existence of the Mississippi sandhill crane.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternatives would avoid jeopardy to the Mississippi sandhills crane: Only tamper resistant bait boxes may be used outdoors within occupied habitat of the Mississippi sandhill crane.

Incidental Take - With implementation of the reasonable and prudent alternative to preclude jeopardy to the Mississippi sandhill crane, no incidental take is anticipated and therefore none is authorized.

Nene (Hawaiian goose) - This endangered species is found only on the islands of Kauai, Maui, and Hawaii in the State of Hawaii. They feed predominantly on plant shoots, seeds, and berries, and are known to graze on golf courses and other maintained, grassy areas, and pastures where zinc phosphide application would pose a significant hazard. Gosling survival in the wild is now poor, and the wild populations of geese are supplemented regularly from captive-reared birds. Without these captive breeding programs, the species would not survive in the wild except in areas where they receive supplemental feed and are protected from predators. Based on the avian toxicity data available on zinc phosphide, ingestion of the compound would be expected to be fatal. Because of the above-mentioned threats, it is the Service's biological opinion that use of zinc phosphide near golf courses in Hawaii is likely to jeopardize the continued existence of the nene.

Reasonable and Prudent Alternative(s)- If implemented, the following reasonable and prudent alternative would avoid jeopardy to the nene: prohibit use of zinc phosphide within the 100 yards of occupied habitat of the nene, unless it is contained in tamper resistant bait boxes.

Incidental Take- With the implementation of the reasonable and prudent alternatives to preclude jeopardy to the species, no incidental take is anticipated and, therefore, none is authorized.

Puerto Rican plain pigeon - The Puerto Rican plain pigeon would primarily be exposed to zinc phosphide while foraging in treated agricultural fields. The baits could be ingested as the pigeon forages. Ingestion of bait would be fatal, and bird kills have been documented during field studies. Due to the small population size of this species and its flocking habit of frequenting crop fields, any pesticide induced poisoning and mortality could threaten the survival of the species. Therefore, it is the opinion of the Service that the use of zinc phosphide is likely to jeopardize the continued existence of the Puerto Rican plain pigeon.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the Puerto Rican Plain pigeon: Only tamper resistant bait boxes may be used outdoors within the species' occupied habitat.

Incidental Take - Because of the chemical's toxicity and potential widespread use, and the potential for the species to expand its range, even if the above-mentioned reasonable and prudent alternatives are strictly followed, the Service anticipates that an unquantifiable

level of incidental take may occur as a result of this chemical's use in areas outside the current range of the species.

Reasonable and Prudent Measure(s) - To minimize incidental take, EPA must establish a monitoring/enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

Yellow-shouldered blackbird - The yellow-shouldered blackbird would be exposed to zinc phosphide through the pesticide's registered uses on agricultural fields. These birds often flock to agricultural fields to feed. Ingestion of bait would be fatal, and bird kills have been documented during field studies. Due to the small population size of this species and its flocking habit of frequenting crop fields, any pesticide induced poisoning and mortality could threaten the survival of the species. Therefore, it is the opinion of the Service that the use of zinc phosphide is likely to jeopardize the continued existence of the yellow-shouldered blackbird.

Reasonable and Prudent Alternative(s) - If implemented, the following reasonable and prudent alternative would avoid jeopardy to the yellow-shouldered blackbird: Only tamper resistant bait boxes may be used outdoors within the species occupied habitat.

Incidental Take - Because of the chemical's toxicity and potential widespread use, and the potential for the species to expand its range, even if the above-mentioned reasonable and prudent alternatives are strictly followed, the Service anticipates that an unquantifiable level of incidental take may occur as a result of this chemical's use in areas outside the current range of the species.

Reasonable and Prudent Measure(s) - To minimize incidental take, EPA must establish a monitoring/enforcement program. The terms and conditions of such programs are outlined in the introduction section on page I-5.

RATIONALE FOR NO JEOPARDY DETERMINATIONS

Gray wolf and Grizzly bear - Zinc phosphide is registered for use on a wide variety of sites which could occur near or in gray wolf or grizzly bear habitat including orchards, rangeland, forest, agricultural crops, recreational areas, rights-of-way, and animal burrows. It is used to control mice, rats, ground squirrels, moles, pocket gophers, prairie dogs, and muskrats. EPA provided no hazard ratios but stated that zinc phosphide is acutely toxic to mammals where they would ingest granules or bait. Also according to EPA, there should be little opportunity for predators or scavengers to be secondarily exposed to the pesticide. Even though the gray wolf and grizzly bear occurs in some of the same counties where these registered uses of zinc phosphide may occur, the Service believes that the chances of gray wolf or grizzly bear mortality as a result of them feeding on granules or bait to an extent that would result in such a mortality of the species is extremely remote. Therefore, it is the Service's opinion that the use of zinc phosphide is not likely to jeopardize the continued existence of the gray wolf or grizzly bear.

Incidental Take - Because zinc phosphide is toxic to mammals and because there are some registered uses that may occur in gray wolf and grizzly bear habitat, the Service anticipates

that an unquantifiable level of incidental take may occur as a result of the gray wolf or grizzly bear consuming granules or bait.

Reasonable and Prudent Measure(s) - The following reasonable and prudent measures for minimizing incidental take and their implementing terms and conditions should be adopted: with the exception of tamper resistant bait boxes, prohibit the application of zinc phosphide in the geographic range of the gray wolf and grizzly bear until the user has contacted the local Service office and that office has determined that there are no known wolves or grizzly bears in the general vicinity of where zinc phosphide is going to be applied.

San Joaquin kit fox - This species may be subject to zinc phosphide exposure because of the extremely wide variety of use patterns for which this chemical is registered. Areas within the kit fox range (the San Joaquin Valley of California) where zinc phosphide is likely to be used include municipalities (e.g., Bakersfield); oil fields; rangelands; agricultural areas; orchards; aqueduct, canal, and levee embankments; golf courses; and other recreational areas. However, because there appears to be little risk of secondary poisoning as a result of zinc phosphide use, kit foxes would have to consume zinc phosphide baits directly for exposure to occur. Nonetheless, several zinc phosphide bait types are likely to attract kit foxes and to be consumed, including pellets, tablets, and pet food formulations; and some permitted application methods increase the likelihood of kit fox exposure, including broadcast baiting and applications to burrows. Overall, however, potential adverse effects of zinc phosphide use on the San Joaquin kit fox appear to be relatively minimal because of the lack of secondary exposure risk, and the fact that the species is relatively wide-ranging. Zinc phosphide is widely regarded as a safe alternative for rodent control in the San Joaquin kit fox range. The Service therefore concludes that zinc phosphide use is not likely to jeopardize the continued existence of this species.

Incidental Take - Although possible exposure of the San Joaquin kit fox to zinc phosphide probably is minimal, the Service anticipates that an unquantifiable level of incidental take may occur as a result of zinc phosphide use within the range of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the San Joaquin kit fox will be minimized: (1) Prohibit zinc phosphide applications to burrows and outdoor broadcast applications of all pellet, tablet, and pet food zinc phosphide baits within the occupied habitat of this species; and (2) prohibit all other outdoor uses of pellet, tablet, and pet food zinc phosphide baits within the occupied habitat of this species, unless such baits are confined to tamper resistant bait boxes designed to exclude access by San Joaquin kit foxes, or a similar kit fox protection program for zinc phosphide, approved by the Service in writing, is implemented.

Utah prairie dog - Zinc phosphide is a restricted use rodenticide registered for a variety of sites that could occur in or near prairie dog habitat including rangeland, rights-of-way, and animal burrows. Existing labels require that zinc phosphide not be used within the habitat of the Utah prairie dog. With this continued label restriction on all uses of zinc phosphide, it is the Service's opinion that the use of zinc phosphide is not likely to jeopardize the continued existence of the Utah prairie dog.

Incidental Take - With the continued implementation of the label restrictions protecting the Utah prairie dog, no incidental take is anticipated and thus none is authorized.

San Clemente sage sparrow - The primary exposure to zinc phosphide from registered applications for rodents could occur if bait is ingested by this sparrow which is primarily a ground forager for insects, spiders, and seeds. It is the biological opinion of the Service that use of zinc phosphide is not likely to jeopardize the continued existence of the San Clemente sage sparrow.

Incidental Take - The service anticipates that an unquantifiable level of incidental take may occur as a result of zinc phosphide use within the occupied habitat of this species.

Reasonable and Prudent Measure(s) - If the following reasonable and prudent measures are implemented, incidental take of the San Clemente sage sparrow will be minimized: prohibit the use of zinc phosphide within the occupied habitat of the San Clemente sage sparrow, unless it is contained in tamper resistant bait boxes.

Whooping crane - Zinc phosphide is a restricted use rodenticide registered for a variety of sites that could occur in or near where whooping cranes also may occur including rangeland and agricultural crops. It is used to control a number of species of rodents including mice, rats, ground squirrels, and pocket gophers. Whooping cranes do, at times, feed in these areas and could be impacted by ingesting either granules or bait. EPA stated that zinc phosphide is acutely toxic to birds but did not provide any hazard ratios. Thus, EPA provided little information on the impact of zinc phosphide to a large bird the size of a whooping crane. However, it is anticipated that the whooping crane would feed in zinc phosphide treated areas only rarely. Previous EPA labels require that zinc phosphide not be used in whooping crane habitat. Therefore, it is the Service's opinion that the use of zinc phosphide is not likely to jeopardize the continued existence of the whooping cranes.

Incidental Take - Because of the toxicity of zinc phosphide to birds and because there is a possibility of a whooping crane occurring in areas treated with zinc phosphide, the Service anticipates that an unquantifiable level of incidental take may occur as a result of zinc phosphide use. It is unlikely that zinc phosphide use could be precluded from all whooping crane use because the species uses a wide range of habitats.

Reasonable and Prudent Measure(s) - The following reasonable and prudent measure for minimizing incidental take and its implementing term and condition should be adopted: the user should insure prior to the use of zinc phosphide that no whooping cranes have wandered into a proposed treatment area. The above measure does not apply to the use of tamper resistant bait boxes as long as the bait boxes are not used on prairie dog colonies to control prairie dogs; the food source of the black-footed ferret.